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LIST OF FOREIGN AGENTS (see first page "Official Notices").

Contents:

	PAGE
The Evolution of Electric Cookers	121
Wireless Waste	122
Problems of Trade and Industry	122
Municipal Engineers and their Committees	122
The Sydney Engineer and his Aldermen	123
An Engineer shall Lead Them	123
Monorail Trains Again	123
Electricity Supply from the Pit Head (*illus.*)	124
The Science Exhibits at Wembley (*concluded*)	125
The Errors of Potential Transformers, by G. W. Stubbings (*illus.*)	126
Electricity at the Royal Agricultural Show (*continued*)	128
Correspondence—	
American Underwriters' Laboratories	129
Is there an Age Limit?	130
An Illustrated Course of Lectures	130
Definitive Units	130
The Faraday Society	130
Business Notes	131
Lighting and Power Notes	135
Tramway and Railway Notes	137
Telegraph and Telephone Notes	138
Radio Notes	138
Telephotography in America (*illus.*)	139
A Record of Half-a-Century (*illus.*)	141
Contracts Open and Closed	143
Notes	144
Institution Notes	146
Our Personal Column	146
New Companies Registered	147
Official Returns of Electrical Companies	148
City Notes	148
Stocks and Shares	149
Market Quotations for Chemicals and Metals	150
The Problems of Trade and Industry	151
The Commercial Outlook for Radio	152
Exports and Imports of Electrical Goods and Machinery in June, 1925	153
French Electrical Trade	153
The South-East Lancashire Electricity Board	154
Factories and Workshops	155
New Electrical Devices, Fittings, and Plant (*illus.*)	156
Electricity Supply in Ulster	157
Women in Science, Industry, and Commerce	158
Legal	159
Parliamentary News	160
Published Specifications	160
Contractors' Column	Advertisement page xxxvi

The Evolution of Electric Cookers.

THE excellent collection of cooking apparatus brought together at the Brighton Convention of the I.M.E.A., of which we gave some particulars in our issue of July 17th, was noteworthy not only as evidence of the commercial activity of the manufacturers represented, who realised the importance of the opportunity to get into close touch with the municipal delegates and the Brighton public, but also on account of the indications of progress and improvement in design which were to be noted on every hand.

There was a marked tendency towards the adoption of "plug-in" heating elements—a feature which we have long hoped for. In some cases not only the top-plate fittings, but also the oven elements were of this type. This movement by no means indicates a lack of reliability, for steady progress has been made in the design of heating elements for long life, and at least one maker guarantees his boiling plate for twelve months (and expects the elements to last three times as long). Our own experience in this connection has been thoroughly satisfactory, but failures are bound to occur sometimes, and ease of replacement is a feature of great importance to undertakings which hire-out and maintain cooking apparatus.

In most cases the open top—more or less screened by a grid—was preferred for the boiling plate, but solid tops were also shown, and there is much to be said for the latter; if the loading of the larger plate is 1,800 or 2,000 watts, it acts quickly enough for all practical purposes. But there were several examples of boiling plates of refractory material, in which the heating spirals were adequately protected and the pans could sit on the plates themselves, and this seems to be a very promising direction for progress. The use of separate strips of earthenware or porcelain for supporting the spirals was widely adopted, and ease of rewiring was generally provided for.

The hinged top plate which gives ready access to the heating elements is a feature of many designs, and facilitates maintenance; at the same time, it ought always to be provided with a reliable fastening. The inquisitive child at a loose end must be borne in mind—what

he can accomplish with a hairpin or a pair of scissors is almost unbelievable, and various kinds of serious accidents would be made possible if he could raise the hob.

The design of the oven showed many improvements in detail. The internal corners were usually rounded, and other provision was made to facilitate cleaning—an important point which has not always been kept in mind. In some cases the whole of the interior casing could be removed bodily. The old controversy between side heating and top-and-bottom heating is not yet settled; each method has its convinced advocates. The question depends somewhat upon local conditions, which vary widely in different parts of the country. Some makers were prepared to fit either type, and at least one effected a compromise, which may add a little to the cost of the cooker, but will certainly increase its elasticity in use.

An interesting question is the demand for thermometers; these are usually fitted when asked for, and one maker put the proportion at about 50 per cent., but generally it appears to be less than this. The cost of the thermometer varies widely; we think it should be kept as low as possible, to encourage the use of the instrument and thus secure not only better cooking, but also economy of energy. In some cases a simple dial indicator depending on the expansion of metal or gas is substituted for the mercury thermometer; the former is certainly preferable on the score of legibility, and it should be possible to attain sufficient accuracy for practical purposes.

If the makers of electrical cookers, &c., could now get together and agree upon a few fundamental standards, a great deal of future trouble would be avoided, and their business would be benefited. The rating of the hob fittings is already approaching uniformity; the sizes and loadings of ovens, the dimensions of plugs and sockets for heating elements, the diameters of boiling plate apertures and the sizes of hobs, could be standardised much more easily now than in a few years' time. If the makers will remember that the important thing is to make it easy for the public to use electric cookers, and will act accordingly, they will do the best for themselves and for the public. What is wanted is team work.

Wireless Waste.

ELSEWHERE in this issue we reproduce from the monthly *Journal* of the British Empire Chamber of Commerce in the U.S.A. some notes on the position and prospects of American trade in radio apparatus. Unhappy results have attended the operations of many wireless traders, especially of the smaller class, on this side of the Atlantic during the last few years, and the *Journal* shows that credulous people in the States have been suffering from the misfortune that has followed the exploitation of the speculative possibilities of the business there. Losses running into many millions of dollars have been experienced by those who put their money into the innumerable new companies. In this country there have been few public issues of capital on the large scale, and those that have taken place have been made on the basis of recorded results which may continue to be satisfactory for a time, but the electrical trade generally is more directly interested in the weekly arrival of new concerns, small it is true in the great majority of cases, and the weekly departure of traders or companies who have not managed to make a success of their operations, thus saddling those from whom they have made their purchases with a substantial volume of wireless bad debts. We may hope with the writer of the notes referred to that sooner or later the business will settle down on to a plain commercial basis. While the possibilities of the trade are still almost unlimited, it must be recognised as one of the inevitabilities that organisations which are badly financed and poorly managed "will pass out of existence," as they ought to do. Unfortunately, the trade suffers as well as the bad managers and the optimistic financiers—perhaps sometimes more so. That is why the movements for the safeguarding of the trade and of the traders of the country should receive support. The radio-apparatus trade has reached immense proportions in a remarkably short time, and that circumstance, together with the great inherent attractiveness and popularity of "listening-in," and the constant technical changes and improvements, have brought quick losses to some and quick fortunes to others. We hear more of the former than of the latter, but that is only natural. That the present situation in the trade is unsatisfactory is unquestioned. The problem is two-fold: the British manufacturer of material asks for the safeguarding of his business against the extremely low-priced competition from abroad; yet while these very cheap lines are in the shop-windows in their thousands, British retailers ask for support for their movement against price-cutting amongst their own class of trader. We published a letter from the chairman of the Wireless Retailers' Association in our last issue, in which the subject of increased trade discounts was discussed, and we now have before us a list of 119 firms of manufacturers who have already agreed to support the movement of that Association for dealing with undercutting. The list is to be officially published, and dealers are invited to place before the Association any price-cutting information that may come before them. It is hardly to be expected that permanence or finality of anything radio can be introduced at this stage, but stability and security for the industry are its most pressing and essential needs.

Problems of Trade and Industry.

INCLUDED amongst our commercial and industrial matter this week is a series of contributions relating to expert investigations of some of the most pressing problems affecting the life of the nation. "The Survey of Overseas Markets" which has been issued by the Balfour Committee on Trade and Industry should be in the hands of every present or prospective export trader. It will be of service to keep on the shelves as a work of reference, but before it is placed there its contents should be digested by those directly engaged in foreign trade activities; trade associations will doubtless make profitable use of it in the interests of their members. The statement by a Committee of the Federation of British Industries on the propositions to introduce subsidies to industries in place of doles to individuals, is interesting. It views any general subsidy scheme with marked disfavour for the very good reason that the progressive manufacturer may be placed at a disadvantage through the assistance rendered to the concern resting in a rut of inefficiency; but it indicates substantial reasons why the principle may be applied in particular industries to the national advantage. The third contribution which the student of industrial subjects will do well to read, is the statement made by the Federation in connection with the findings of its Economic Staff regarding some of the factors which have produced our present trade position.

Municipal Engineers and their Committees.

FEW engineers and managers of municipal electrical undertakings can adopt a definite policy without fear that changes in the *personnel* of the Committee or the Council may imperil its continuity. The most satisfactory systems are those in which the "chief" and the chairman of Committee have kept close company for many years together. Stability, harmony, and progress are possible under such circumstances. The chairman who knows a good engineer when he sees him will place confidence in his technical and other expert recommendations, and the engineer who has a wise and capable chairman knows that he can rely upon sound judgment being brought to bear when his propositions have to be considered from the standpoint of public policy. Nobody who has had an opportunity to study municipal electrical activity in this country at close quarters will suppose that relationships between engineers and their

councillors have always been, or are now, entirely happy. Indeed, there have been plenty of cases where things have been quite otherwise, but it must be admitted that of late one has heard fewer complaints of chiefs being eager to change over from municipal to private service. Perhaps electrical engineers are accorded a higher status than formerly in the local estimation as their undertakings grow in importance; perhaps councillors are more alive to the unwisdom of interfering with the details of operations requiring very specialised training and knowledge that they do not possess; possibly engineers themselves show a more accommodating spirit. But whatever the reason, we believe that discontent is rarer than it once was. We suppose that few things are so hampering to an engineer as uncertainty regarding the mind or the "policy" of his committee. However anxious he may be to make headway, there will be a brake upon his enterprise unless he can rely upon a consistent backing when he gives a sound lead.

The Sydney Engineer and his Aldermen.

In making the above comments, we are moved to express our sympathy with Mr. Forbes Mackay, the city electrical engineer of Sydney, New South Wales, who, if Press reports be correct, has been suffering from the disadvantages which sometimes attend changes in the Council. He complained recently that he was harassed in the performance of the duties of his office by the delays of the City Council in dealing with his recommendations. He quoted specific instances, to which we refer below. After matters had passed the Electricity Committee they were held up by the Council, and the efficient working of the department was hindered. In his criticism he had the support of the Town Clerk, who said that there had been occasions when not weeks, or months, but actually years, had been allowed to elapse before the Council had given its decision. Some of the Labour aldermen waxed indignant at the thought of a mere paid official daring to criticise their action or inaction, but another alderman held that it was in the best interests of the citizens that the senior officers of the Council should be at liberty to bring forward such a criticism if the work of their department was unreasonably interfered with. Mr. Mackay was allowed the special privilege of replying to his critics in the meeting, and from the Press reports to hand it appears that he had no difficulty in combining a full justification of his complaint with a reasonable appeal for the avoidance of delays. The Town Clerk's view was that if departments were to be efficiently controlled the Council must co-operate with the officers in charge of them by dealing expeditiously with the recommendations that they brought forward. But all the publicity given to the matter did not incline the Labour aldermen to drop their hostility, and they rejected Mr. Mackay's report.

Now for aldermen or city councillors to presume that their official position renders them immune from criticism is laughable. In our opinion, Mr. Mackay and the Town Clerk fulfilled a public duty by revealing what had been happening. In 1922, it seems, there was delay in filling the appointment of power house superintendent, and subsequently against the engineer's recommendation it was filled only temporarily. In October, 1924, he recommended the appointment of a "Safety Officer," and that matter had not been dealt with down to May last. Last December he reported a case of indiscipline in the department, but it had not been dealt with in April. Therefore, in the mildest of words, he said: "The work of the officer in charge of the Electricity Department is sometimes made more harassing than seems necessary by delay in finalising matters . . . brought forward by the head of the department."

The hopeful feature of the situation is that the aforesaid aldermen are annoyed that the matter has received so much publicity. The vigilance of the public, if it can be aroused, is a stimulus to efficiency, and that vigilance is frequently aroused by the ventilation of grievances.

An Engineer shall Lead Them.

THE Sydney matter is interesting enough in itself, but it will probably give rise to many reflections in the minds of Mr. Mackay's *confrères* in this country who are faced with their own peculiar local circumstances. Everybody recognises that the question whether a borough electrical engineer and manager is or is not head over his own undertaking may depend largely upon personality or popularity. Given a weak man, his committee will manage him and manage his department too, —perhaps mismanage it. If he be a strong, sound, capable man he will co-operate with them if he can, and only manage them if he must. The engineer whose efforts to carry on successfully are deliberately thwarted by his elected employers can only speak in the Council chamber by consent. In the presence of the Council he is required to sit and listen in silence; only at his peril will he rise to his feet, or while seated throw out a hasty remark, impetuously to pay back in their own coin the duly appointed representatives of the people, however absurd their statements or misstatements. It is in the committee-room, or through the medium of his committeemen or other councillors, that he must ventilate his feelings and justify himself. Men have lost their "jobs," or have had to resign before they were ready to do so, after committing the unforgivable sin of taking the floor without permission. We have heard whispers of engineers of strong will and personality who rule their committees as with a rod of iron; others gently persuade them—so much depends upon the committee and so much upon the man. Some officials "sing small," curry favour, and even go against the dictates of conscience, in order to preserve peaceful relations; but they can never hold themselves in very high esteem for so doing—nor does anybody else whose opinion is worth having. On the whole, the courageous course as adopted at Sydney seems to be the right one because it was necessary that somebody should protest when the efficiency of the public service was suffering.

Monorail Trains Again.

UNDER this heading, with the subtitle "An Old Invention Perfected," a correspondent of the *Morning Post* states that Mr. Louis Brennan has "perfected the gyroscopic monorail system of transport," and quotes the inventor's glowing account of its virtues. We gave some particulars of the system 18 years ago and on later occasions; the fundamental idea is to maintain an electrically-driven coach upright on a single rail by means of a gyroscope. That this can be successfully accomplished is certain, but whether it is a practicable proposition is quite another matter. "All things are possible unto us, but not all things are expedient," and the monorail system, we think, falls in the latter category. We said in 1907: "As a 'scientific toy' . . . the Brennan monorail car is highly interesting; but that is probably the extent of its usefulness" and we have not modified that opinion in the interim.

A monorailway was actually installed in Ireland which did not employ gyroscopes; stability was secured by the use of two auxiliary rails, so that in reality it was a three-rail line. It was abandoned many years ago. On a line which, we believe, is still in operation in Germany, the cars are suspended from a single overhead rail, so that the system is inherently stable. Most extravagant claims were made for the Behr monorailway, which was to have been built from Manchester to London, but that project did not materialise. In point of fact, there is no need for such schemes, no matter how ingenious they be; the sweet simplicity of a track with two running rails and no stabilising mechanism but gravitation renders it immune from attack by any other railway system, and the only competitor that it has to fear at present is the open road. Mr. Brennan is putting forward his system for "Empire development," and does not advocate its use in densely populated countries such as this; his discretion is commendable.

D

Electricity Supply from the Pit Head.

The Pooley Hall Colliery Co.'s Undertaking.

A GREAT deal has been said in recent years regarding the advantages of generating electricity at the pit-head instead of carting coal to a large number of generating stations situated at varying distances from the coal areas. While it has not been decided whether this would really effect the anticipated economies if carried out on a large scale, the principle has been adopted with success in a number of smaller instances.

One case which has been recently brought to our notice is that of the Pooley Hall Colliery Co., Ltd., which is supplying electricity to the town of Tamworth, Staffordshire. Just over a year ago a committee of the Town Council was appointed to consider the question of a supply of electricity for the borough. The company then offered to provide the whole of the necessary capital and contract with individual residents for a supply to them. The Corporation accepted this proposal, with a provision that it should be able to take over the scheme at any time after the expiry of four years from the signing of the formal contract with the company.

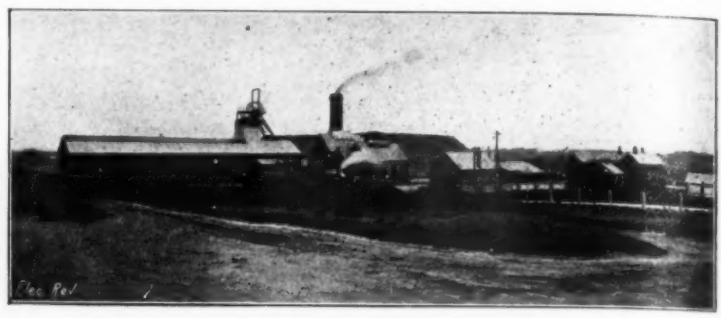

Fig. 1.—The Pooley Hall Colliery.

The undertaking was formally inaugurated on October 1st last year, and has since been forging ahead. Fig. 1 is a general view of the Pooley Hall Co.'s colliery; the interior of the power house is illustrated in fig. 2. The company is devoting special attention to the development of the domestic load. It has a very attractive rate for electric heating and cooking (1¼d. per kWh), and has recently instituted a scheme for the hire of cooking equipment at reasonable quarterly rates varying from 6s. for a large cooker to 1s. 6d. for a grill. In order to bring this scheme before the public of the district an electrical exhibition was recently organised. In this matter the company had the benefit of the assistance of the Credenda Conduits Co., Ltd., whose apparatus is being employed under the scheme. As a result of the exhibition, orders were booked for a total of 132 cookers, and it is possible that another 40 will be required in connection with a local housing scheme.

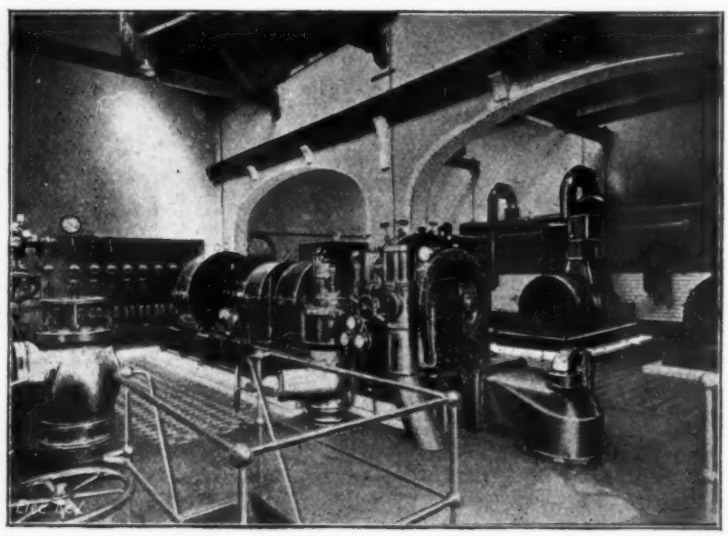

Fig. 2.—The Pooley Hall Power House.

The exhibition is illustrated in fig. 3. In addition to the Credenda Conduits Co., whose display is seen in the background, a number of leading electrical companies held stands. Reference is made to these in our "Business Notes" section. There were also two special exhibits, one of which was a "Hopkinson" electrically-driven coal-cutter, as used at the Pooley Hall Colliery, and the other an exhibit of applications of electricity to farming.

Fig. 3.—A View of the Tamworth Exhibition.

At the opening ceremony, Col. Chaytor, the chairman of the company, outlined the purposes of the exhibition, and mentioned the company's hiring scheme. The Mayor of Tamworth said that the rate for heating and cooking was a great concession for a town of the size of Tamworth. He congratulated the company on having connected up nearly 1,400 consumers since the inauguration of the supply.

The accomplishment of the company is indeed a matter for congratulation when it is seen from the last "Municipal Year Book" that the population of Tamworth is only just over 8,000. Not many towns can show such a large proportion of electricity consumers.

The Science Exhibits at Wembley.

The Royal Society's Display in the Government Pavilion.

(Concluded from page 85.)

The Atom.

Sir Joseph Thomson, O.M., F.R.S., is showing apparatus by which the existence of electrons was detected and their mass and velocity measured, and Sir Ernest Rutherford, O.M., F.R.S., deals with some aspects of radio-activity and their bearing on atomic structure, including the production of radium emanation; the discovery of the nature of alpha particles, counting and scattering them; and the artificial disintegration of elements, &c. Mr. D. R. Hartree exhibits models, made at the Manchester University physical laboratory, illustrating atomic structure.

Clarendon Laboratory, University Museum, Oxford (Prof. F. A. Lindemann, F.R.S., Mr. T. C. Keeley, and Mr. E. Bolton King) demonstrates a method of making audible the movement of α- and β-particles in an electric field. Owing to the larger mass of α-particles, as compared with β-particles (7,000 to 1), both of them, in spite of the difference in speed, possess much the same energy. When one of these particles strikes an atom, it usually breaks off one or more of the outer electrons, leaving the mutilated atom (or ion) with a positive charge. In an electric field these ions move, thus transferring charge and thereby forming an electric current. If the field is strong enough, the velocity of the ions rises to such a high value that they themselves can break electrons off other atoms, forming new ions which in their turn repeat the process. In this experiment, so powerful a field is maintained between the two electrodes, that the ions formed by one single α- or β-particle produce sufficient new ions to give a momentary current, which, when amplified, works a loud-speaker.

Slow Oscillations.

The apparatus exhibited by the N.P.L. (Mr. D. W. Dye) in this section consists of a triode generator of audio-frequency currents, a resonant circuit and various indicating devices; currents from this source are made to flow through an inductive coil, and the resulting magnetic field is used to demonstrate resonance and selective absorption, and heating, directive, and acoustical phenomena. The G.E.C. research laboratory shows thermionic rectification, including an experimental high-power rectifier for use on a 30,000-volt supply; the copper anode is cooled by a water jacket, the electron emission from the filament being over 5 amperes.

Gamma- and X-rays.

Mr. F. D. Edwards illustrates the beautiful effects obtained by passing an electrical discharge through a 4 ft. 6 in. glass tube during reduction from atmospheric pressure to high vacuum. A number of Crookes' and other tubes are shown.

The National Physical Laboratory (Dr. E. A. Owen) demonstrates the penetration of metals by X-rays, and Dr. G. W. C. Kaye shows visually the relative transparency to X-rays of some half-dozen elements ranging from carbon (graphite density 1.6) to lead (density 11.4), while the Röntgen Society has arranged a display of historic X-ray tubes selected from the collection at the Science Museum. Sir W. Bragg, K.B.E., F.R.S., illustrates the analysis of crystal structure by X-rays with the aid of his ionisation spectrometer, a Müller spectograph and models representing the arrangement of the atoms in crystals.

Ultra-Violet Rays.

In this section the Clarendon Laboratory, University Museum, Oxford (Prof. F. A. Lindemann, F.R.S., and Messrs. T. C. Keeley and E. Bolton King) shows Schumann X-rays. The energy of electrons ejected from metals under the influence of radiation is equal initially to the energy of the quantum of the radiation concerned; this quantum is simply proportional to the frequency, so that red light ejects comparatively slow electrons, whereas violet light ejects electrons of twice the energy, or $\sqrt{2}$ times the velocity. If the metal exposed to the light is insulated, on losing electrons it acquires a positive charge which attracts the electrons and tends to slow them up, ultimately, when the charge is high enough, preventing them from escaping altogether. Hence, an insulated piece of metal will acquire a charge proportional to the frequency of the incident light. It is shown that an insulated electrode connected to an electrometer acquires a charge of some three volts when exposed to visible light. When exposed to radiation produced by stopping electrons the velocity of which corresponds to a potential drop of some hundred volts, the electrode charges up to a potential of the same order as that producing the radiation. Under the influence of X-rays, the electrode charges up to thousands of volts, and the radiation shown in this experiment is therefore of a frequency intermediate between X-rays and the ultra-violet. This is the region of the spectrum which in ill-informed circles is said to include the "death-ray." The whole experiment has to be carried out in a vacuum, as the slightest trace of air entirely absorbs radiation of this frequency.

Visible Rays.

The exhibit of the Clarendon Laboratory, Oxford, under this heading is designed to show that the emission of electrons under the influence of light, *i.e.*, the photo-electric effect, can be applied to a large number of scientific and industrial uses which involve comparison and measurement of light intensities, while Mr. T. H. Harrison indicates the method of colour matching that has been developed by the G.E.C. research staff and is being adopted at the N.P.L.

Prof. F. Horton, F.R.S., and Dr. Ann C. Davies show the excitation of the spectra of gases by electron impacts. The apparatus consists of a small glass vessel supported between the poles of an electromagnet. The vessel contains the gas to be experimented upon at a low pressure, usually a few tenths of a millimetre, and sealed into it are two parallel, lime-coated, platinum filaments which are heated electrically, one at a time, and supply the electrons for the bombardment of the gas. A short distance beneath the two filaments a circular grid of fine mesh platinum gauze is situated, while a circular disk of platinum is placed parallel to and concentric with the grid at a distance of about 1.5 cm. from it. The electrons from the filament are accelerated towards the grid by means of a potential difference supplied by a battery connected to these two electrodes outside the apparatus. Some of the electrons pass through the interstices of the gauze into the space between the grid and the disk, where they collide with gas atoms. The production of luminosity results from the recovery of the atoms after such impacts, and the magnetic field in which the apparatus is situated concentrates the luminosity into a bright central column between the grid and the disk; by watching for changes in the spectrum of the luminosity as the potential difference applied between the filament and the grid is gradually increased, the voltages necessary for the excitation of different groups of lines can be determined. For such an investigation, the grid and the disk would be connected together outside the apparatus.

Solar and Terrestrial Radiation.

This exhibit constitutes a link between the purely physical and geophysical sections, and is arranged to illustrate recent British contributions to meteorology, terrestrial magnetism, and atmospheric electricity (Dr. C. Chree and Mr. C. S. Wright) and seismology.

Conclusion.

In the botany section Prof. V. H. Blackman, F.R.S., shows electrical apparatus for determining the amount of water lost by a potted plant in the process of transpiration and for recording the rate of growth, while Dr. E. D. Adrian, F.R.S., has on view a selection of electrical measuring devices for research in physiology. The undermentioned firms have provided instruments and apparatus for demonstration purposes:—B.T.-H. Co., S. G. Brown, Ltd., Cambridge Instrument Co., Cox-Cavendish Co., Dubilier Condenser Co., Edison Swan Co., W. Edwards & Co., G.E.C., Adam Hilger, Ltd., M. O. Valve Co., Marconi's Co., Metropolitan-Vickers Co., Mullard Radio Valve Co., W. G. Pye and Co., Siemens Bros., H. W. Sullivan, Ltd., H. Tinsley and Co., Watson & Sons (Electro-Medical), Ltd., and the White Electrical Instrument Co., Ltd.

The Errors of Potential Transformers.

By G. W. STUBBINGS, B.Sc., A.Inst.P.

In a previous article the writer dealt with the determination of the errors of series transformers by comparison with a standard transformer having known errors, and using apparatus of a kind found in test rooms of moderate size.* The method of comparison is very suitable for the determination of the errors of single-phase potential transformers, and the present article deals in detail with the conduct of such tests. It is assumed that there is available a standard potential transformer of identical ratio with that of the transformer to be tested, the errors of which are known when loaded with a voltmeter and a wattmeter potential coil. A single-phase induction meter can be substituted for the wattmeter if desired, and this will be quite suitable for the quadrature adjustments.

The errors of potential transformers are, as a rule, much smaller than those of series transformers, in that the applied voltage is practically constant, and the condition corresponding to a relatively small fraction of full-load current of a series transformer does not obtain. The secondary voltage will always be less than the primary voltage divided by the turns ratio, but it is possible to compensate for this ratio error for a given secondary burden with great exactitude by adjustment of the number of primary turns. The phase shift of the secondary voltage cannot, however, be corrected, nor is the direction of this

Fig. 1.

phase shift almost invariable as is the case with a series transformer. Referring to fig. 1*a*, we here have the vector diagram for a transformer with a non-inductive secondary burden. The exciting current i_e may be comparable in magnitude with the secondary current i_s but, as it traverses the primary winding only, it may be taken to cause one-half the drop of a similar current in the external circuit. The impedance drop in this case leads the secondary voltage, and the phase error of the transformer is lagging. In fig. 1*b* the secondary burden is inductive, as would be the case with the pressure circuit of an induction meter. In this case the lead of the impedance drop on the total equivalent current is less than the lag of this current and the primary vector lags the secondary.

The principle of the method of comparison will be clear from a consideration of fig. 2. The standard and the test transformers are each excited from the same e.h.p. voltage, the secondary of the former being connected to a voltmeter and a wattmeter, the latter being connected to its normal burden. The difference voltage is impressed on the potential coil of a second wattmeter, which can be excited by currents in phase with, or in quadrature with, the secondary voltage of the standard transformer. If w_1 i_1 and w_2 i_2 be the watts and current corresponding to these conditions with a secondary voltage v_s, then it is easy to see that the difference in the percentage ratio errors of the two transformers is $100w_1/i_1\ v_s$, and the difference in their phase angles is $w_2/i_2\ v_s$ radians or $57.3\ w_2/i_2\ v_s$ degs.

The diagram of connections, fig. 4, shows how this test can be carried out without the use of any special apparatus, and there are only one or two points requiring comment. The e.h.p. supply to the two trans-

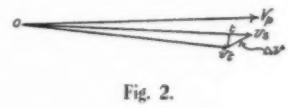

Fig. 2.

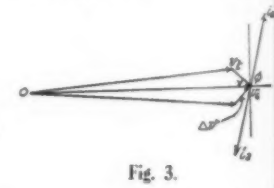

Fig. 3.

formers will probably be obtained from a third potential transformer inverted. The volt-ampere loading of the step-up transformer will not only include the secondary loads of the two transformers being compared, but also their exciting currents. There may, therefore, be a considerable drop in the step-up transformer, resulting in a h.p. voltage well below normal. If the iron of the transformers is worked near saturation, the exciting current may be comparable with the load current, and, moreover, the magnitude of the exciting current will be very sensitive to voltage changes. For this reason it may be necessary to give a small boost to the h.p. voltage on the transformers being compared, so that normal pressure, as indicated by the voltmeter connected to the standard transformer, is obtained. The method of boosting, by the use of an auto-transformer with a number of taps, is easily understood from the diagram. Failing an auto-transformer, some sort of potentiometer connection can easily be arranged to give the required boost, care being taken that the boosting voltage is from the same phase as supplies the h.p. side of the step-up transformer.

The method of obtaining the exciting currents for the difference wattmeter calls for a few remarks. From the diagram it will be seen that a 3-phase supply is available, and a bank of lamps, connected in star, is used to obtain the required currents. The position of the star point can be varied, by means of a slider rheostat, to obtain zero reading on wattmeter w_1, this indicating that the exciting current is in quadrature with the voltage v_s. To obtain the in-phase current, one leg of the star is switched out, the remaining legs of the star being in series across the phases supplying the step-up transformer. Provided there is a negligible phase shift in the step-up transformer, the exciting current so obtained will be nearly in phase with v_s. This can be tested in the following way: When the quadrature adjustment has been made, the potential on w_1 and v is

* ELEC. REV., April 18th, 1924.

changed over to the supply to the step-up transformer. If v_2, i_2, w_2 are the watts, current, and voltage respectively under these conditions, w_2/i_2v_2 will give the sine of the angle of phase shift, and, if necessary, the determinations of ratio error difference can easily be corrected for the departure of the exciting current from the in-phase condition. Regarding the ratio test, it need hardly be said that the pressure circuit of W_1 should be opened before switching over the exciting current, if this be above the full rated current of the instrument.

The accuracy obtainable by this method is usually greater than with the corresponding method for series transformers, as only one voltage has to be dealt with, and this will usually be the full rated voltage of the wattmeter. If double full load current can be used for wattmeter excitation, 0.2 per cent. of the full scale reading on W_2 will correspond to a voltage difference of 0.1 per cent. Thus, differences in ratio error of 0.1 per cent., and of about 3½ minutes of phase angle, are easily observable with a suitable wattmeter.

The readings of the difference wattmeter will not indicate whether the errors of test transformer are greater or less than those of the standard. The direction of the difference can be determined by temporarily switching on to the test transformer a considerable extra non-inductive load, say, a 100-V 32-c.p. carbon-filament lamp and observing the effect on the difference wattmeter reading. The additional load will diminish the secondary voltage, and if therefore, for the ratio test, the reading of W_2 is increased by this extra load, this will indicate that the secondary voltage of the test transformer for the normal burden is less than that of the standard. If, however, the reading of W_2 is diminished or reversed, the standard transformer will have given the lower voltage. The same procedure applies to the phase error test. The effect of the non-inductive burden is to cause a lag of the secondary voltage. If, therefore, the connection of the additional load diminishes or reverses the reading of W_1, the test transformer voltage will have been leading that of the standard, and *vice versa*.

Modification of the connections to suit a 2-phase supply will not be difficult. It will, however, not be easy to obtain sufficient current in quadrature with the supply voltage when only a 1-phase supply is available, unless additional complications are introduced. If, however, by the use of choke coils the maximum permissible current of the wattmeters can be obtained with a lag of over 60 degrees, the phase error can be obtained easily by a short additional calculation. When the difference wattmeter is excited by the lagging current, the readings of W_1, V and A will enable the angle of this lag, ϕ, to be determined. Fig. 3 is the vector diagram for these conditions, i_2 being the exciting current of the wattmeter. The reading of W_2 is then given by—

$$w_2 = i_2 \Delta v \ (\sin \gamma \sin \phi \pm \cos \gamma \cos \phi).$$

The positive sign applying when v_1 lags v_2 and *vice versa*, then $w_2/i_2v = a \sin \phi \pm r \cos \phi$,

where a is the true phase angle difference in radians, and r is the ratio fractional difference as determined by the in-phase test. From this expression, a can be calculated, but the correction for the phase shift, if any, of the step-up transformer will be more difficult to make. The effect of an additional non-inductive burden will be to increase the lag of v_1 and to diminish the reading of W_2 if the voltage of the test transformer leads that of the standard—the same rule applying as when a true quadrature current is used. The effect of the additional load will enable the requisite sign of $r \cos \phi$ in the above expression to be obtained.

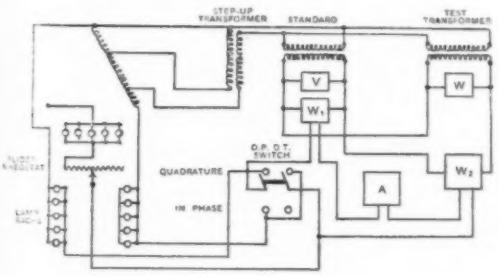

Fig. 4.

The effect of h.p. protective resistances on the errors of potential transformers can easily be determined by the method described above. If, however, the characteristics of the secondary burden and of the exciting current are known, these effects can easily be calculated. If the secondary current be i_2 and its phase angle θ, the exciting current referred to the secondary i_e, with a phase angle β, and R the total resistance in series with the transformer, the phase error is $\frac{R}{n^2v_2}(i_e \sin \beta + i_2 \sin \theta)$ radians, the voltage on the transformer leading the supply voltage.

The ratio error is—

$$\frac{100R}{n^2v_2}(i_e \cos \beta + i_2 \cos \theta) = \frac{100R}{n^2v_2}(w_e + w_2),$$

n being the ratio of transformation, and w_e and w_2 the exciting and secondary watts respectively.

The case of three resistances for two potential transformers connected in open delta is not so simple, since the current in the resistance in the common lead is not in phase with that in the others. Knowing the ratio and phase errors occasioned by a single resistance in series with the primary, it is easy to calculate the total effect of the two resistances in circuit with each transformer. If r be the ratio error of the single resistance expressed as a fraction and not as a percentage, and a the phase angle in radians, then for the blue transformer, the equivalent errors are given by—

$$\text{Phase error} = \left(\frac{2+\sqrt{3}}{2}a + \frac{r}{2}\right) \text{radians},$$

$$\text{Ratio error} = 100\left(\frac{3}{2}r - \frac{\sqrt{3}}{2}a\right) \text{ per cent.}$$

For the red transformer—

$$\text{Phase error} = \left(\frac{2+\sqrt{3}}{2}a - \frac{r}{2}\right) \text{radians},$$

$$\text{Ratio error} = 100\left(\frac{3}{2}r + \frac{\sqrt{3}}{2}a\right) \text{ per cent.}$$

Referring again to fig. 1, it is readily seen that if the resistance and impedance of the transformer are known, in addition to the data regarding exciting and secondary currents, the total phase error of a single-phase transformer can be calculated from the formula—

$$a = \frac{z}{v}\left\{\frac{i_e}{2}\sin(\beta - a) + i_2 \sin(\theta - a)\right\} \text{ radians},$$

z being the impedance of the transformer with a phase angle a and β the lag of the exciting current. The impedance data can be obtained by ordinary short circuit and resistance tests, if instruments of the required ranges are available. Unless the exact turns ratio is known, it is not possible to obtain the ratio error directly by this method.

B.E.S.A. Specifications.—The British Engineering Standards Association has issued the following specifications:—

No. 218, 1925, for brass bars and sections suitable for forgings and drop forgings. The copper content of this material is specified to be not less than 58 per cent., and the minimum tensile strength 20 tons per square inch with an elongation of not less than 25 per cent.

No. 219, 1925, for soft solders. This covers nine grades of tin-lead solder intended for electrical purposes, tinsmiths' and coppersmiths' work, steel tube joints, lead cable wiped joints, &c. Typical purposes for which the various grades are particularly suitable are mentioned in the table of analyses.

Copies of these new publications can be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, price 1s. 2d. each, post free.

Electricity at the Royal Agricultural Show.

Practical Demonstrations of Electrical Methods of Farming.

(*Continued from p. 86.*)

The main purposes for which electric power was demonstrated on the Chester showground in connection with farm pursuits were: refrigerating, milking and milk cooling, corn grinding and milling, conveyors, ploughing, mole draining, cultivators, winnowing, barley dressing, seed cleaning, churning and separators, thrashing machinery, water pumping, pasteurising, barn machinery, bottle washing, bacon slicing, oil refining, crop drying, lighting, heating, fans, and for general purposes.

The Institute of Agricultural Engineering of Oxford University aroused great interest by the employment of electric power for driving a blower which forces hot air into a stack of green material such as grass or cereals, for the purpose of artificial drying. The power consumed for this purpose is in the neighbourhood of 20 h.p. This demonstration shows the convenience of the use of electricity for this purpose. Tractors can also be used for the work, but where electric power is available, it is much better, on account of its being more reliable than the ordinary tractor, and free from fire risk.

An Electro-Farming Conference.

On the second day of the Royal Show an Electro-Farming Conference was held. The attendance of agriculturists was poor, having regard to the importance of the subject to be discussed and the expertness of the various speakers. Lord Bledisloe presided and said that the Conference had been called by the Electrical Development Association at the suggestion of Mr. R. Borlase Matthews. If their Continental and Transatlantic competitors were using electricity with good results, then British agriculturists would have to do the same, to improve the economic condition of agriculture in this country. Even the up-to-date experienced and enlightened farmer would approach the subject cautiously. He asked to be satisfied that electricity on the farm was a sound commercial proposition, likely to be profitable to him. It might be suggested that conditions were quite different in this country from what they were in Denmark and South Sweden, where electricity provided the bulk of the power, but it had to be admitted that this form of power was useful for a greater number of purposes than had been yet conceived. As an agriculturist, he felt that farmers had to move cautiously, but at the same time move forward. He had electricity on his farm for the purpose of grinding barley for his pigs, and he was now installing power for the mixing of pig foods. He calculated that the latter machine would save the services of one and a half men, and do the work more efficiently.

Mr. S. E. Britton then opened the discussion with a short paper on the use of electricity in agriculture, of which the following is an abstract:—

It is the custom of the Royal Agricultural Society to invite competition at its annual shows in specified classes of implements. These trials serve to direct the public mind to the development of the mechanical aids to agriculture which is continually in progress. Up to now the Society has not seen fit to invite competition involving the aid of electricity in agriculture. This meeting may be the means of a change in that direction. As each new form of power is evolved the question of its application to agriculture invariably follows, the inference being that the farmer is not satisfied with manual and horse power, and thinks there will be a more suitable substitute at his disposal ultimately.

There is a growing number of people who think that electricity will eventually be the power used on the farm. Whatever be the inherent good in associating electricity and agriculture, progress will be difficult, slow and costly, so long as there is no established route whereby the farmer and the electrical engineer can approach this subject on equal terms.

Although it has been possible to obtain powers to supply over wide areas both in bulk and to authorised distributors since 1900, very few supply authorities have attempted to supply in rural areas. Electricity cannot be taken into such areas by any other means than overhead lines if the supply is to be given at cheap rates, and every obstruction to the granting of consents tends to increase the cost and the price at which electricity can be sold. In negotiating wayleaves, distributing authorities must give the utmost consideration to the wishes of the land-owner and the occupier, and the purpose the land is put to.

Briefly, the present condition of the electricity supply industry, and the use of electricity in agriculture, is as follows:—

1. The Electricity (Supply) Act, 1919, enables electricity to be taken into the rural districts.

2. The conditions governing the setting-up of Distribution Authorities are not satisfactory or conducive to the most economical supply being given in rural districts.

3. There is an economic problem to be solved, to enable electricity to be transmitted from the source of supply to the potential users in the rural districts.

4. The Electricity Commissioners' Rules and Regulations governing the construction of overhead transmission and distribution lines set up too high a standard of perfection, thereby increasing the cost of overhead lines.

5. There is no technical or engineering problem to overcome in the application of electricity to the homestead for lighting, heating, cooking, and power in the house, the dairy, the shippon, the barn, the hen-house, the yard, and for the supply of water.

6. Practical demonstrations of electricity on the land for ploughing, cultivating, reaping, and the treatment of crops, have already been made. The results obtained, if not absolutely perfect, promise an early solution and the development of suitable electrical apparatus for such operations.

7. Electroculture is an extremely fascinating subject. It is being carefully explored by scientists, in the hope of developing something practical for the farm.

8. The cost of generating and distributing electricity under specified conditions is not difficult to ascertain. It is important to know how much the farmer can afford to pay for electricity for the various uses to which it can be economically applied. When that is ascertained a suitable tariff can be formulated.

9. There is a lack of co-operation between the agriculturist, implement makers, and the electrical industry. An organisation to bring them together is urgently needed.

10. Experience has shown that there is no visible limit to the application of electricity to all purposes. But hitherto electricity has not been called upon to take its place in the attempt to solve such problems as the intensive cultivation of the land, or to secure the stability of the noblest of industries, agriculture.

In the discussion Sir John Russell said that it was for the electrical engineer to bridge the gap now existing between the position taken up by the agriculturist and that of the electrical engineer. The latter had to bring his inventions down to the level at which they established contact with the farmer. For domestic purposes, lighting, power, heating, the pumping of water, the working of bacon factories, dairies, light railways, &c., the advantages of electricity to the agriculturist were so obvious that all that had to be done was to solve the problem of how to get the electricity where it was wanted. A second group of problems involved the use of power for traction purposes, operating cultivating implements, driving machinery in barns, and so on. Finally, there was a group of problems which, as yet, had not emerged from the laboratory; he referred to the electrical treatment of crops, the sterilisation of milk, the drying of crops, &c. With regard to the use of electric power on the farm, whilst the problem might have been solved from the engineering point of view, he was not satisfied that it had been from the farmer's point of view. Engineers should remember that farming devices were not worked by men of a mechanical turn of mind; they were accustomed to dealing with animals. Electrically-operated machinery intended for the farm must embody certain features which, to the skilled engineer, might appear unnecessary. The farmer had an incurable habit of leaving his machines out-of-doors and not lubricating them; electrical engineers had to think in terms of the men who were addicted to these habits. Again, electrical machinery must be flexible. If comparison were made between the cost of a unit of power, electricity and horse—electricity had an enormous advantage, yet the farmer continued to make great use of the horse. At Rothamstead it had been shown that the cost of ploughing an acre of land by tractor was considerably less than by horse; yet the horse was not being displaced to any great extent by the tractor. There was a time after the war when the tractor went ahead, but now there was a tendency for the horse to come back again, because the horse was a flexible unit which could do many classes of work. It would take a great deal of work on the part of the engineer to get the farmer to adopt electricity sufficiently to cope with the harvest and yet be able to employ it generally during the year. Electricity must be cheap. Farm machinery was not in use all the time. There might be weeks when it was lying idle, and the farmer could not afford to incur a big outlay on plant which did not show the probability of an early return. It was obvious that some jobs about the farm could very well be done, and would be done by electricity, and he expected considerable developments as soon as power was available. He referred specifically to machinery for cake

breaking, root-cutting, and other tasks which had to be done daily, regarding that as the most hopeful line of approach. Farmers usually hired thrashing machines, but there was a tendency for them to acquire their own instruments, and that held out the possibilities for an increasing use of electricity. He was not so hopeful with regard to the use of electricity for cultivating purposes. Farmers had to face the unknown factor of depreciation in expensive electrical equipment. In the use of tractors for ploughing purposes, depreciation turned out to be much heavier than was expected. It was a problem to which engineers must devote attention. The application of electricity to the drying of crops was now being studied; experiments had been made on a number of farms. This was a thing to watch, but not to advocate yet to farmers. The use of electricity for stimulating crop growth had been studied in great detail at Rothamstead. There had been increases in yields up to 20 per cent., but they did not know how these results were obtained. They could never say beforehand whether an increase could be obtained or not. They did not know when to apply electricity, or how long, or whether to apply a.c. or d.c. The possibility of reducing friction in ploughing by the use of electricity had been engaging attention, and favourable results had been attained. Engineers should bear in mind all the time that farmers had an economic problem to solve. As soon as it was directly obvious that electricity was cheaper and better than power from oil engines, they might expect to see progress.

Mr. BORLASE MATTHEWS said that on his 600-acre farm there were 67 applications of electricity, and he had only two horses. In the agricultural industry there were 200 applications of electricity. He thought they were at the beginning of an electrical era in agriculture. On the farms of the world there were nearly one million farmers using electricity; in this country there were only 400, but he hoped that within a year this number would be doubled. Electricity was used largely in every national industry except farming, and he considered that its possibilities in that connection should be investigated to determine how far it could be successfully applied. He agreed that the problem was a commercial one. One of the main avenues for the employment of electricity on the farm was for the lighting of stock sheds. It saved time every day. On dairy farms it paid to have electric light; in a good light there was less milk spilt. The daily spillages in time amounted to more than the cost of a good installation. At the present time there were 50 poultry farms using electric light, and they had registered results 43 per cent. better than when none was employed. There were also possibilities in electricity for the market gardener. When seedlings were transferred they were apt to fall down and become wilted next day; he had found that, when electric light was applied overnight, the seedlings became fresh and vigorous next morning—in fact, they developed a week's growth overnight. Plants in this way could be brought forward in a wonderful manner. Daffodils had flowered in four days and narcissus in seven days. The application of electric light had accomplished three or four weeks' growth in four to seven days. The first thing the farmer should do was to equip his chaffing machines with power. Some farmers were also employing centrifugal dust extractors; the extraction of this small dry dust was much better for stock. For the pumping of water electricity might also be usefully employed, and when a supply could be delivered at a pressure of 30 to 40 lb., instead of the ordinary farm trickle, the benefits to the farmer were obvious. In the installation of plant, he agreed that the farmer required robust machinery, but this was already available in the squirrel-cage induction type motor, which did not demand much attention. There were two forms of electric motor—(1) the industrial motor and (2) the agricultural electric motor. The latter had been designed so that it could be safely left out in the open, and it could always run when the farmer wanted it to run. The life of the industrial motor was a long one; some little time ago he was on a farm where the farmer told him that his motor had been running 25 years, and he bought it second-hand then. Electricity was not, and never would be, used simply because it was electricity; it had to be shown that it was cheaper and better than any other form of power. The farmer was essentially a business man, and it was open to remark that there was no business in which there were so few bankruptcies as in farming. The farmer in the past had been often imposed upon by inventions which purported to do what they did not; hence the farmer now proceeded very cautiously, and, before associating himself with revolutionary devices, had first of all to be assured that he was on safe ground. That was one reason why the electrical engineer had to get into closer touch with the farmer to ascertain his precise needs.

Mr. J. W. BEAUCHAMP, director of the Electrical Development Association, mentioned that it was hoped to arrange similar electrical conferences in different parts of the country. He believed that there was an electrical appliance for every job on the farm.

Mr. HOWARTH, an agriculturist who is now using electricity on his 400-acre farm, said that the farmer was mainly concerned with the economic possibilities of various forms of power, and many of them were coming to realise that electricity was cheaper than either oil or gas engines. He had been using electricity for several years, and since becoming connected to the Chester Corporation supply system he had been surprised at the great economies which had resulted.

Mr. C. T. ALLAN, of the South Wales Electric Power Co., said that in South Wales the mains passed a lot of farms, 200 of which were connected, most of them being of about 50 acres. His method of approach was not to the farmer but to the housewife, who, after all, was the hardest-worked person on the farm. They endeavoured to interest her in electric light, electric ironing, electric washing, and so on. After that they tried to get the farmer to install a 3-h.p. chaff cutter. As regarded ploughing, he thought that the local supply authority should undertake to plough fields on contract.

Mr. G. YOSHIDA, electrical engineer, of Tokio, gave particulars as to what had been done in Japan in connection with electric farming.

Mr. WALKER, a member of a firm of farming implement manufacturers, said that if progress was to be made in electric farming, there must be co-operation between the electrical engineer, the manufacturer, the farmer, and the supply authority. In the United States there were experimental electric farms. A similar venture should be made here.

Sir JOHN RUSSELL supported this idea. He suggested that engineers should equip a dairy farm and let it be worked by farmers, in order that engineers might ascertain and adequately appreciate the attitude of the agriculturist.

(To be continued.)

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

American Underwriters' Laboratories.

Through absence from England I have got rather behind with my reading, so have only just seen the Editorial on "Standards of Quality and Performance" in the ELECTRICAL REVIEW for July 3rd, and the request therein for particulars of the experience of any reader with the Underwriters' Laboratories of the U.S.A.

As I believe the matter is one which should be of general interest to British manufacturers, I am glad of this opportunity of giving the experiences I have had in connection with the time switch business in which I am interested.

It was in 1911 that I first came up against the Underwriters' Laboratories. I use the words "up against" intentionally because that is exactly how I felt when faced with the discovery that I could not sell in a British Dominion—Canada—without the approval of an American concern. It roused my British pride and I felt very defiant about it, but my Canadian friends rightly pointed out that as our English insurance companies had handed them over to American offices, they had to comply with the latter's requirements and were not going uninsured just to please their own, my, or anybody else's patriotism. It is as well for us all, over here, to understand this point of view, as it will save a lot of ruffled feelings.

Having recovered from this first antagonism, my next shock came when my firm submitted for approval a time switch that incorporated a tumbler switch. To an Englishman, brought up on tumbler switches, it came like a bolt from the blue when I was told that such switches were not allowed. This perhaps points to one of the dangers of a National Proving House—it may become more national than proving. I suppose, at the time of which I am writing, I was not the only one having a dig at the Underwriters' Laboratories. I seem to remember Messrs. Berry Skinner having a tilt at them. Anyway, they proved themselves quite reasonable people and Mr. Dana Pierce, now their president, came over here, studied things on the spot, and appointed Messrs. Heap & Digby to represent them and test for them any British goods submitted. One outcome was that tumbler switches are now not unknown in the States, where they were soon being advertised as a great discovery. Another was that we got our time switches approved and, in general, things went along very smoothly as far as I know. Since the war, Messrs. Heap & Digby have ceased to handle this business and I have found it rather a difficulty to get approvals through. This, however, I am bound to say is not due to any obstacles put in the way from the other side, but rather to slackness and lack of common sense, or technical ability, on this. My first thought was that the B.E.A.M.A. would like to take action for the common good of its members, but it declined. In the end, the Underwriters' Laboratories deputed the Fire Offices Committee here to make the tests, we supplying current, instruments, and other facilities—not an easy matter where, as in this instance, a current of 300 amperes at 500 volts, d.c., had to be switched on and off 50 times at the rates of six times per minute. For special cases (and this happened to be one of them) there are no cut and dried rules, and rules relating to the nearest apparatus are taken as a general basis. This is where I found on this side a want of understanding and reasonableness which makes me hope that if ever we have a proving house in England it will not be under the control of the fire insurance people. For any further approvals I may want, I should send the articles straight out to the States, where they have the facilities for testing almost anything electrical and do not seem to be unreasonable in their requirements.

In general, I am not enamoured of the proving house idea. I have already given some reasons—and fears—but the main point, and one on which I think all manufacturers will be agreed, is that it will either stop progress or be generally disregarded. We never really reach finality in manufacturing; always there are little alterations being made—different materials being used, slight re-arrangement of parts and similar changes in materials, methods and design—so that very few articles would be as per sample submitted by the time the approval came through. Are we, therefore, to stand still lest we incur the rejection of our goods because a letter-of-the-law official notices a cheese-headed screw where a rose-headed one occurs in the approved sample?

Your hope that a "Proving House would furnish a very much more effective protection of British manufacturers against cheap foreign accessories" I am afraid would not be realised. "Approval" never has been, and, I think, never will be, a guarantee of satisfactory operation.

I hope I have made it clear that so far from finding it "almost, if not quite, impossible for a British or other manufacturer to secure the services of the Bureau," I have always experienced courtesy and fairness from the Underwriters' Laboratories. That there are difficulties cannot be denied, but these are due to the differences in ideas that one finds between one country and another. For instance, we have to use a type of terminal to comply with their requirements which we do not think is so good as our English standard. Possibly if more British manufacturers were involved, or the B.E.A.M.A. were interested, conditions might become easier.

Ernest E. Sharp.

London, S.W.1, *July 17th*, 1925.

Is There an Age Limit?

I have read with interest the letter in your issue of July 10th, by Mr. L. P. Ives, on the question of age limit, in connection with the procuring of appointments in the electrical profession. My advice to Mr. Ives is to keep it as dark as possible about his thirty-three years' experience when applying for posts. What seems to be wanted nowadays by most employers in the electrical trade is a young man who has had practically no experience whatever, and who has never held a really big post in the electrical profession, but is "full of beans," and open to take a post only fit for an experienced man at a salary about half the figure the experienced man deserves and is well worthy of. No doubt quite a number of such youngsters fill the bill, but even if they don't, it does not worry them much if they have to move on to another job, as they are always getting experience and have not much at stake.

I should advise Mr. Ives to abstain from advertising his age and experience too much when he is applying for a post, unless he is certain that the advertisers want, and would appreciate, a man of sound and lengthy experience in engineering, and would be willing to pay a suitable salary to such an applicant. The old catchword "too old at forty" appears to be too much thought of by electrical employers, but if they would only think of recent conditions and the often blank ten years, since the war broke out, as regards business experience, put in by many young men who were with the forces, they would alter their ideas as to the most suitable age for the men they appoint to responsible posts. It is surprising, the number of men of 50, or even 60, who are nowadays more fit, mentally, morally, and physically, than the present type of young man of 30. I take the liberty of subscribing myself,

"Too Young at Forty."

July 14th, 1925.

An Illustrated Course of Lectures.

We wish, through the medium of your paper, to express our hearty thanks to Mr. A. M. Parkinson, B.Sc., A.M.I.E.E., for his very interesting series of lectures forming the "Summer Course," for which he used the kinematograph.

We are pleased to hear that it is to be used in future lectures, and wish Mr. Parkinson and the Battersea Polytechnic Institute every success in these.

A. G. S.

Fulham, *July 15th*, 1925.

Definitive Units.

With regard to your editorial Note on "Definitive Units" in the June 5th issue of the ELECTRICAL REVIEW, I enclose a leaflet on "Octic" arithmetic.

Units based on the decimal system will always have limited usage. Until we change our base for calculating from ten to eight we will not have universal units. The persistence of the English money system is due to its binary divisions. Twelve as a base is just as objectionable as ten. The first contains the odd factor three, while the second contains the odd factor five.

However, I have no illusions regarding the probability of a change from ten to eight. Nothing less than a miracle, something wholly unexpected, will bring the change.

E. M. Tingley.

Chicago, Ill., U.S.A.
July 7th, 1925.

The Faraday Society.

The Electrodeposition of Zinc.

Now that the winning of zinc by electrolysis is in commercial operation and the method is likely to extend as time goes on, a study of the conditions under which good deposits can be obtained is of considerable interest and importance. A paper embodying a careful experimental research on zinc deposition from acid zinc sulphate solutions (which in practice have almost, if not entirely, replaced the chloride solution) was communicated to the Faraday Society on July 6th by Dr. A. L. MARSHALL, now in America. The work, which was carried out at University College, London, was primarily designed to obtain a closer insight into the effect of temperature on the characteristics of a zinc cathode and also to study the variation of current efficiency with temperature.

At first sight it would appear impossible to deposit zinc from an acid solution, seeing that zinc is far more electropositive than hydrogen and it would be expected to dissolve readily. It is only on account of the high discharge potential of hydrogen at a zinc electrode, its "over-voltage" to use the current term, that the latter is preferentially deposited at the cathode from a solution containing both zinc and hydrogen ions. If the zinc ion concentration is low, or the solution contains small amounts of other metal ions, the overvoltage may be so modified that hydrogen will be deposited more readily than zinc, and it therefore becomes important to study the potential effects at a single zinc electrode, using a standard hydrogen electrode for reference. Dr. Marshall has carried out a useful series of experiments on this point, evaluating the potential of the zinc electrode at various current densities, at different temperatures and with electrolytes of varying zinc content. In all cases the potential was found not to exceed a certain (negative) limiting value. An explanation based on chemical polarisation is put forward of the variations observed and also of the increase in efficiency of zinc deposition with rising temperature.

In the experiments to determine the effects of varying temperature, current density, and the concentrations of zinc and acid on the current efficiency of zinc deposition, Dr. Marshall employed an aluminium cathode placed between two peroxidised lead anodes. The composition of the electrolyte was kept approximately constant by adding pure zinc oxide from time to time. As was to be expected from the experiments with the single zinc electrode, there was invariably found an increase of efficiency with rising temperature, the increase being more marked with solutions of lower zinc content. Metals such as nickel, cobalt, and iron have been found to show this behaviour even more markedly than zinc. The effect of varying temperature and concentration of zinc and acid on the power consumption of the zinc cell was also investigated and again it was shown how the efficiency of deposition increased with rising temperature.

Finally, Dr. Marshall has studied the effects of metallic impurities on the electrolyte on the efficiency of zinc deposition. In the case of iron, small quantities had little effect on the efficiency, but larger quantities were very harmful, although nothing like so baleful as small quantities of antimony. Manganese, under certain conditions, when not so much was present as to be suspended in the solution in the form of oxide, actually retards the formation of hydrogen and so increases the efficiency of the zinc deposition.

Incidentally, a copper coulometer was developed in the course of the experiments, which may be of some general interest. It consisted of a circular platinum gauze cathode which was rotated at about 1,000 r.p.m. and a heavy sheet copper anode. The latter was ring-shaped from a sheet of copper 4 inches by 18 inches; with a current of 12 amp. the anodic current density was 0.03 amp./cm.^{2} The coulometer solution consisted of 125 gm. hydrated copper sulphate, 50 gm. concentrated sulphuric acid, and 50 c.c. alcohol in a litre of water.

Tests made on this coulometer using a standard Weston ammeter to measure the current gave the following results:—

Time.	Current.	Weight Copper (Found).	Weight Copper (Calculated).
10 mins.	15 amp.	2.965	2.964
,,	,,	2.964	,,
,,	12 amp.	2.369	2.371

The copper deposit was beautifully hard and coherent. The results show that this is a very convenient method for measuring even comparatively large currents.

Irish Free State Electricity Supply Bill.—In moving the second reading of the Electricity Supply (Special Powers) Bill in the Dail last week, Mr. McGilligan, Minister of Industry and Commerce, said that the whole principle of the Bill was to prevent new plant being installed, and to allow undertakings which had a surplus of plant to supply undertakings requiring additional energy, pending the materialisation of the Shannon scheme. The second reading of the Bill was passed and the next stage is fixed for November 3rd.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

Our Issue of August 7th.—Our Advertisement Department draws attention to the fact that, owing to the August Bank Holiday, new copy and alterations to existing advertisements for the issue of the ELECTRICAL REVIEW for August 7th must be received by Wednesday morning, July 29th, at the latest. All matter for our editorial pages will also require to be in our hands earlier than usual.

E.D.A. Activities.—Publication E.D.A. 566 which has recently been issued by the British Electrical Development Association illustrates and describes an ideal all-electric home. The booklet is written in a practical and interesting manner, while its pictures immediately create a most favourable impression of the cleanliness, convenience, and comfort of electrical service.

Electricity in Tin Mining.—In his speech at the recent annual meeting of the Sungei Besi Mines, Ltd., Mr. W. J. Payne said that larger dividends would have been paid had it not been for the necessity of reserving money to meet the cost of the new hydro-electric plant. A thorough investigation of the possibilities had been made, and a water licence had been secured from the Government of the Federated Malay States. It was hoped to make a commencement almost immediately, and there was no doubt that the scheme would result in lower production costs.

The Highland Show.—Electrical equipment for farm and dairy was prominent at the annual show of the Highland Society which was held in Glasgow last week. Among the exhibits were a windmill-generator for electric lighting and pumping shown by Messrs. McBain Bros., Ltd., of Tweedmouth; a 130-gallon cream separator with the driving motor incorporated in it, by Messrs. Watson, Laidlaw & Co., Ltd., Glasgow; crop-drying plant, shown and demonstrated by Messrs. Telford, Grier and Mackay; another wind-dynamo installation, for battery charging, made by Messrs. F. A. Wilkinson & Partners, Ltd., and shown by Mr. A. M. Russell, Edinburgh; and various apparatus exhibited by Messrs. McKenzie and Moncur, Ltd.

Employment during June.—The July *Ministry of Labour Gazette* shows that employment in the electrical engineering industry continued good during June. While the total proportion of unemployed for all branches of engineering was 11 per cent., in the electrical branch the figure was on 5.6 per cent. In the heavy engineering industries the proportion of unemployed was 12.3 per cent. Unemployment decreased in the electrical wiring and contracting industry, and in electrical cable, wire and lamp manufacturing, by 0.8 and 0.1 per cent., respectively.

Insuring against Bad Debts in Export Trade.—Mr. A. M. Samuel, M.P., the Parliamentary Secretary of the Department of Overseas Trade, has appointed a Committee, under the chairmanship of Colonel the Hon. Sidney Peel, to consider the question of insurance against bad debts in export trade. The Committee comprises representatives of the banks, accepting houses, insurance companies, Lloyd's, the Association of British Chambers of Commerce, and the Federation of British Industries, together with the Comptroller-General of the Department of Overseas Trade. Mr. F. H. Nixon, of the Export Credits Department, will act as Secretary.

Trade Announcements.—MESSRS. DORMOR & HINES, who have commenced business as wholesale electrical suppliers at 74, Old Christchurch Road, Bournemouth, wish to receive priced trade catalogues.

The notice in our issue of July 10th, p. 56, respecting a new "Exide" depôt at Glasgow was not quite correct in certain particulars. The purpose of the depôt is to give wireless and car-starter battery service and it will be under the control of Mr. A. T. Fraser, while Mr. Donald Sinclair will continue to act as the general representative for the whole of Scotland for all the CHLORIDE COMPANY'S manufactures.

The TWEEDALE MOTOR CO. LTD., Peebles, has opened an electrical and wireless department.

Catalogues and Lists.—MESSRS. DONOVAN & CO., 47, Cornwall Street, Birmingham.—An illustrated and priced folder dealing with the "Wandsworth" patent combination switch with automatic action.

MESSRS. SIEMENS BROS. & CO., LTD., Woolwich, S.E.18.—Catalogue 190, containing very full particulars of the company's ebonite manufactures with details of physical and electrical characteristics.

THE VACUUM OIL CO., LTD., Caxton House, Westminster, S.W.1.—A pamphlet dealing with steam cylinder and valve lubrication, specifying "Gargoyle" oils prepared for these purposes.

MR. J. R. MORRIS, Imperial House, 15-19, Kingsway, W.C.2.—Two illustrated pamphlets dealing with "Columbia" radio batteries.

SWITCHGEAR & COWANS, LTD., Old Trafford, Manchester.—Catalogue sections Nos. 4, 14-1, and 14-3, dealing respectively with spare parts for mining switchgear, "Andrews" reverse-power relays, and earth-leakage protection gear for systems with insulated neutral. Fully illustrated.

LAMLOK, LTD., 237, Acton Lane, Acton Green, Chiswick W.4.—An illustrated pamphlet showing examples of the company's lamp-locking devices.

"MANDA" MOTORS, LTD., 53-54, Royal Mint Street, E.1.—A trade price list of "Manda" electric fans and small-power motors.

MESSRS. FERRANTI, LTD., Hollinwood, Lancashire.—A pamphlet illustrating a patent oil-filled cable box for transformers.

Bankruptcy Proceedings.—G. C. SPONG and J. H. TRUSSELL, trading as the C.C.S. TRADING CO., 30, Western Mail Chambers, Cardiff, electricians.—The public examination of these debtors was held on July 15th at the Law Courts, Cardiff. The debtor Spong stated that the concern was formed in January, 1923, and he acted as manager, his partner knowing most about the working of the business. The ranking liabilities were returned at £413, against assets of £25, leaving a deficiency of £388. The debtors attributed their failure to the loss of a contract. Debtor Trussell, in reply to questions, said that when they started trading he thought the business would keep them both, but the loss of the contract mentioned was disastrous. The examination was closed.

H. J. HEASMAN, Stumford Rivers, Ongar, Essex, company director.—The receiving order in this matter was made recently on a creditor's petition. The statement of affairs shows liabilities of £243 against assets of £1, leaving a deficiency of £242. Debtor attributes his failure to insufficient income. It appears that in August, 1914, he and his wife commenced business in partnership as general mechanical and electrical engineers, at Walthamstow, with £50 borrowed money, since repaid. On October 29th, 1919, the business was formed into a limited company with a capital of £5,000 in £1 shares, the debtor and his wife being allotted 2,200 shares, but he now holds only 10 shares. The following are creditors:—

	£		£
Greig, E. T. & M. R.	75	Income Tax Commissioners ...	20
Island Manufacturing Co., Ltd....	120	Shone, M. D.	25

F. J. NORTH, 13a, Midland Road Wellingborough, Northants, electrical engineer.—The public examination of this debtor was held recently at the County Hall, Northampton. The statement of affairs showed liabilities of £245, against assets of £28, leaving a deficiency of £217. Debtor attributed his failure to bad trade and lack of capital at the outset. The examination was adjourned.

V. G. BAINES, 2, West Street, Wellingborough, Northamptonshire, electrician and radio dealer.—The adjourned public examination of this debtor was held recently at the County Hall, Northampton. The statement of affairs showed liabilities of £185 against assets of £62, or a deficiency of £123. Debtor attributed his failure to lack of capital, working on credit, and competition. The examination was adjourned.

W. A. HUNTLEY, X-ray engineer, Farfield, Burnt Yates, near Harrogate, and 62, Albion Street, Leeds; late of Bradford.—The public examination of this debtor took place on July 17th, at the Harrogate Bankruptcy Court, when the statement of affairs showed gross liabilities of £1,233, of which £1,211 was expected to rank for dividend, and there were no assets. The examination was closed.

F. H. P. HOOLAHAN (Holloway Bros.), electrical engineer and instrument maker, 16, The Hale, Highams Park, and 209, Holloway Road, N.—Bankrupt discharged subject to consenting to judgment for 30s. being entered against him and payment of 30s. costs of judgment. (30s. paid to the Official Receiver in lieu of entering up judgment.)

W. K. M. WILSON, electrician and wireless apparatus dealer, 1, Mount Street, Heanor.—First meeting July 23rd, at the Official Receiver's offices, 4, Castle Place, Nottingham; public examination September 22nd, at the Court House, Derby.

H. FILDES, electrical engineer's superintendent, 108, Monton Road, Eccles.—First meeting July 22nd, at the Official Receiver's offices, Byrom Street Manchester. Public examination September 17th, at the Court House, Salford.

C. W. STOCKEN & C. FINK, Wyndham Radio Supplies, 71 and 80, Redcliff Street, Bristol.—Trustee, Mr. J. P. Emett, 18, Nicholas Street, Bristol, released June 18th.

G. W. TEMPEST (Northern Radio Co. & General Wireless Trading Co.) radio and telephone engineer, 40, Brazennose Street, and Arcade Chambers, Manchester, and Commercial Street, Leeds.—Receiving order made July 15th, on debtor's own petition.

A. O. JOYCE, electrician, 7, Park Parade, Leamington.—First meeting, July 28th at the Official Receiver's office, 9-11, High Street, Coventry. Public examination, August 19th, at the Shire Hall, Warwick.

J. S. YEOMANS, electrician, 11, Hill View Terrace, Chapel Allerton, Leeds.—First meeting, July 27th, at the Official Receiver's office, 24, Bond Street, Leeds. Public examination, August 5th, at the County Court House, Leeds.

R. A. BURNELL, electrical engineer, Harefield Park, Harefield, Uxbridge.—Receiving order made July 13th, on debtor's own petition.

J. S. TURNER (Stanley Motor Co.), electrical and motor engineer.—Trustee, Mr. E. D. Symond, Official Receiver, 11, Dale Street, Liverpool, released July 2nd.

P. L. SYMONS, electrician, 40, Victoria Road, Great Yarmouth.—Receiving order made July 9th on debtor's own petition. First meeting, July 27th, at the Official Receiver's office, 9, Queen Street Chambers, Norwich. Public examination July 28th, at the Town Hall, Great Yarmouth.

Company Liquidations.—DUBILIER CONDENSER CO.—Winding up voluntarily. Liquidator, Mr. F. W. Hollings, Ducon Works, Victoria Road North Acton, W. Meeting of creditors, July 27th, at Ducon Works. (This notice is purely formal for the purpose of complying with the provisions of the Companies Acts.)

ELBA, LTD., manufacturers of dry batteries, 1, Winchester Place, Acton.—The first meeting of the creditors of the above was held on July 17th, at the offices of the Official Receiver, Russell Square, W.C. Mr. Thomas Gourlay, the Official Receiver, occupied the chair, and reported that the statement of affairs had not yet been lodged. The company was formed on January 29th, 1924, for the purpose of taking over the business of manufacturing dry batteries for electrical purposes, and especially h.p. batteries for radio work. The issued capital was £1,353, of which only £103 was for cash, the balance being in respect of the vendor's shares. A debenture for £1,350 was issued, covering all the assets of the company. A receiver for the debenture-holder was appointed on April 28th last, but he had retired in favour of the Official Receiver, who at the moment was in possession of the assets and was realising them. The whole of the assets were subject to the debenture, and it did not appear that there would be anything for the unsecured creditors, whose claims were in the neighbourhood of £2,200. The assets were only estimated to realise £558. One of the directors stated that the position had been brought about by bad trade and keen competition particularly German competition, and the cancellation of important contracts. He added that when the debentures were issued for cash the assets had already been charged to the bank, and to others, for about £750. The money raised on the debentures was used to discharge those claims. A resolution was passed to the effect that no application should be made to the Court, and the Official Receiver therefore remains as the liquidator of the company.

M.E.L., LTD., 45-7, King's Road, Camden Town, N.W.—The first meetings of the creditors and shareholders of this company were held last week at Carey Street, W.C. The Official Receiver reported that the company was formed in July 1923, to carry on business as manufacturers of and dealers in electrical appliances and accessories. The issued capital was 5,650 ten per cent. cumulative preference shares subscribed for cash, and 2,400 ordinary shares issued as fully paid to the vendors of a business then acquired. The business carried on has been mainly that of manufacturers of and dealers in apparatus and accessories used in connection with radio-telephony; the company had also carried on a small trade in electric domestic appliances manufactured under the patents it had acquired. The failure was attributed to falling off of trade due primarily to the inability of the company to sell its goods profitably owing to foreign competition, and to the general fall in prices of apparatus used for radio-telephony which occurred during 1924. The accounts filed under the liquidation showed unsecured liabilities of £12,331, against assets valued at £2,575, consisting mainly of book debts. The liquidation was left in the hands of the Official Receiver.

LIVERPOOL ELECTRICAL ENGINEERING COMPANY (1923), LTD., 54, Oldhall Street, Liverpool.—A meeting of creditors was held recently at the offices of the Liquidator, Mr. C. Hodgson, accountant, Liverpool. A statement of affairs was submitted which disclosed liabilities of £4,222, of which £2,150 was due on debentures £775 was in respect of cash claims, and there were trade creditors for £1,297. The assets were estimated to realise £1,132, but from this had to be deducted £46 for preferential claims, leaving net assets of £1,086, or a deficiency of £3,136. It was reported that the company was incorporated on May 11th, 1923, to acquire the business previously carried on by Mr. John Clarke. The company took over the existing liabilities and allotted to the vendor or his nominees 1,996 fully paid £1 shares, and eight debentures of £100 each. The nominal capital of the company was £2,000. Subsequently the company purchased further plant and machinery for £525, that amount being advanced by Mr. J. Clarke. Further sums were also advanced to the company by Mr. Clarke, bringing the amount of his loan up to £1,350, for which a second charge was created in September, 1923. The trading of the company to March 31st, 1924 disclosed a loss of £2,297, which was attributed to the fact that the company was compelled to move into fresh premises, which caused it to dispose of certain plant and machinery and stock at a loss. Last September the company examined the position, and in view of the fact that the radio season was about to commence it was decided to continue trading, as there appeared to be some prospect of a profit being made. Those hopes were not fulfilled, and a further loss of £1,408 was sustained up to March last. A creditor for £300 then issued a writ, and the debenture holder appointed a receiver. It was stated that in addition to the amount of £2,150 in respect of which Mr. Clarke held debentures, he was also an unsecured creditor for £775, cash advanced. It was resolved to confirm the voluntary liquidation of the company, with Mr. Hodgson as liquidator.

ELECTROLITE, LTD., 198, Southbridge Road, Croydon.—The first meeting of the creditors of the above was held on July 15th. The Official Receiver said that a statement of the company's affairs had been lodged, showing unsecured debts of £2,166 and loans on debenture bonds of £10,372. The assets were estimated to realise £1,974, so that there was a deficiency, so far as the debenture holders were concerned, of £8,398. The liability to contributories was apparently £500. With regard to the debentures, there was one for £2,000, which appeared to be quite in order, but the Official Receiver said that there was a further debenture for £7,500 which might require consideration, although there did not seem to be anything very material in the point, as if the assets were correctly estimated, there would scarcely be sufficient to pay the debentures about which there seemed to be no question. A receiver and manager was in possession on behalf of the debenture holders. In the absence of a quorum the meeting was formally adjourned to enable the creditors to consider the question of appointing a liquidator.

FALLON CONDENSER MANUFACTURING CO., LTD.—A meeting of members is called for August 22nd, at 122-3, Moorgate Station Chambers, E.C., to hear an account of the winding up from the Liquidator, Mr. R. H. Dutchman.

P. S. WIRELESS MANUFACTURING CO., LTD.—Winding up voluntarily. Liquidator, Mr. E. Webb, 34, Grand Parade, Brighton. A meeting of creditors is called for July 27th at the liquidator's address.

Private Arrangements.—ASTRO ELECTRIC, LTD., 45, Carlton House, Lower Regent Street, S.W.1.—A meeting of the creditors of this company was held recently when the Receiver, Mr. R. Rooke Jones, presented a statement of affairs which showed liabilities of £1,950, of which £653 was due to unsecured creditors; current expenses, &c., amounted to £46, salaries and commission totalled £169, and there were debentures and accrued interest amounting to £1,081. The assets were estimated to realise £1,504, leaving a deficiency of £446. The Receiver said he had endeavoured to dispose of the business, but so far without success. Since he had been carrying on the business the sales for April, May and June of this year had only amounted to £350, and if the business was continued it would not be in the interests either of the debenture holder or the creditors. He did not anticipate that any dividend would be paid to the creditors unless the business could be disposed of satisfactorily. The debenture holder was originally a director, but not at the time the debentures were taken up. The creditors resolved that the Receiver should approach four or five people in the electrical trade who might be interested in the purchase of the business and assets, and that a further meeting should be called as soon as *bonâ-fide* offers were forthcoming.

A. E. G. STONE, 61, Western Road, Hove radio apparatus dealer and electrician.—A meeting of creditors was held on July 15th at the offices of Messrs. Bishop & Fenton-Jones, solicitors, Kingsland High Street, N.E. It was reported that the liabilities amounted to £2,813, of which £1,636 represented money advanced by the debtor's wife; there were trade creditors for £431, and there was a cash creditor for £683. There was also a claim for £209 in respect of advertising. The assets after deducting preferential creditors for £15 were estimated to realise £465. It was reported that the present position was due to very heavy bad debts and keen competition in the neighbourhood. The business was started by the debtor in September, 1921, with a capital of £75. For the year ended September, 1922, there was a loss of £15, while the debtor had drawn from the business only £27. From October, 1922, to March, 1924 there was a loss of £405 and the debtor drew £225. The creditors decided that the estate should be dealt with under a deed of assignment. The following are creditors :—

	£		£
Metropolitan - Vickers Electrical Co., Ltd.	35	Ullman (London), Ltd.	139
Bayleys, Ltd.	50	Pratt, Fred	35
		Mason & Co.	42

W. K. COXON, electrical and radio engineer, Nursh ill, Lydney, Gloucestershire.—A circular has been issued to the creditors herein by Mr. C. Latham, stating that on June 19th a private conference of the larger creditors was held, at which a statement of affairs was submitted showing the assets to exceed the liabilities. The meeting was adjourned, and it was agreed that Mr. Latham, representing the largest creditor, whose account amounted to about half the total unsecured creditors' claims, should make an investigation and prepare another statement of affairs. At a further meeting on June 29th a statement of affairs was presented, and it was stated that negotiations were proceeding which, it was hoped, would result in the sale of the assets of the business for a sum more than sufficient to discharge the creditors' claims. On July 6th, at a further meeting, it was stated that negotiations were proceeding with a company for the sale of the plant, stock and machinery of Mr. Coxon for a sum of £1,000 in cash and the balance in shares in the company, leaving Mr. Coxon with the book debts. If this sale was effected there would be sufficient to discharge the liabilities of the trade creditors of the business in full. It was decided that, in view of the negotiations a deed of inspectorship to Mr. Latham should be

executed. The debtor has approved of this, and the creditors are asked to assent to the arrangement. An approximate statement of affairs shows ranking liabilities of £1,508, of which £1,082 is due to unsecured creditors and £426 to the bank. According to the books, the assets total £3,741, and at a forced realisation they are expected to produce £1,988, giving a surplus of assets over liabilities of £480. As a going concern the surplus is £2,233.

Dissolutions of Partnership.—MAGORIS, WIGHTMAN & Co., electrical engineers, Rusken Chambers Scale Lane, Hull.—Messrs. J. F. Magoris and O. N. Wightman have dissolved partnership. Mr. Magoris will attend to debts and continue the business.

HOWARD TERRY & Co., electrical engineers, Carlton House, High Street, Birmingham.—Messrs. F. H. Jeanes and M. Terry have dissolved partnership. Mr. Jeanes will attend to debts.

Deeds of Assignment.—R. H. W. GOUGH and H. SMITH (Electric & Radio Supply Co.), electrical engineers, 4, Waterloo Road, Epsom.—Particulars of claims by July 31st to Mr. W. A. J. Osborne, Trustee, Balfour House, Finsbury Pavement, E.C.

F. R. HICKSON, electrical engineer, 16, Dartmouth Park Hill, N.W.5.—Particulars of claims by July 31st to the Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

Foreign Capital in Bulgaria.—A recent inquiry into foreign capital invested in Bulgarian industry shows that approximately 2½ millions sterling has been put into 79 companies. Sugar, electricity works, tobacco, and mines are the principal industries with which foreign capital is connected. One-third of the total foreign capital invested comes from Belgium and another 45 per cent. is divided between France and Czecho-Slovakia. British capital invested in Bulgaria is insignificant.—*British Industries.*

Annual Holidays.—The offices of the City Electrical Co. will be closed from August 3rd to 10th.

The Prescot works of British Insulated & Helsby Cables, Ltd., will be closed from Saturday, August 1st, to Saturday, August 8th, inclusive.

The works of Messrs. Alfred Graham & Co. will be entirely closed from the evening of Friday, July 24th, until the morning of August 10th.

The works of the Record Electrical Co., Ltd., at Broadheath, Cheshire, will be closed from to-night, Friday, July 24th, until the morning of Tuesday, August 4th, for the annual holidays.

Book Notices.—"*Journal* of the Institution of Electrical Engineers," Vol. LXIII, July, 1925. No. 343. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

The "Amplion Magazine," which is being produced by Messrs. Alfred Graham & Co., is of rather an unusual character. It is not strictly a "house" magazine, being directed to "all radio users," and although "Amplion" loud speakers receive special notice, it is not really advertisement. A number of interesting articles appear in the first issue, the writers including Capt. P. P. Eckersley, Mr. A. R. Burrows, and Mr. P. R. Coursey, B.Sc. The price is 1s.

"A Description of the Damages done by the Great Earthquake of September 1st, 1923, to the Electrical Installations in Japan"—prepared by the Japanese Electrotechnical Committee, Tokio, Japan.—The damages are treated generally in the order of the classified equipments. The considerations upon many of the peculiar effects are most interesting.

"The Induction Motor," by H. Vickers. Pp. ix. + 319; figs. 151. London: Sir Isaac Pitman & Sons. Price, 21s. net.

"The Post Office Electrical Engineers' Journal." Vol. XVIII, Part 2, July, 1925. London: The Electrical Review, Ltd. Price, 2s. net.

"Scientific Papers of the Institute of Physical and Chemical Research," Tokio.—No. 29, June, 1925.

"Transactions and Abstracts and Journal of Physics of the National Research Council of Japan." Vol. III, Nos. 7 to 10.

"The Technology Reports of the Tôhoku Imperial University," Sendai. Vol. V, No. 1.

Technologic Papers of the U.S.A. Bureau of Standards, No. 284.—A study of the Seasonal Variation of Radio-frequency Phase Difference of Laminated Phenolic Insulating Materials (5 cents). Washington: Government Printing Office.

Callender's Band.—The Band of Callender's Cable and Construction Co., Ltd., whose performance at 2LO gave such pleasure to listeners on two occasions early in the year, again broadcast from the same station on Monday evening last.

Domestic Appliances in Ontario.—According to Mr. G. J. Mickler, head of the Merchandising Department of the Hydro-Electric Power Commission of Ontario, the percentage of fully electrically-equipped homes in Ontario is actually decreasing, probably because electricity is not being installed in all new houses, showing that the field for the sale of equipment is as big as ever. According to a table prepared by the department, reproduced in the *Electrical News*, only 13.8 per cent. of wired houses use electric cookers. The highest percentage (89.2) is reached by electric irons, while only 0.2 per cent. of the consumers have electric refrigerators. Other appliances which show a small percentage of users are water-heaters (4.8) and hot-plates (5.5). No appliance, with the exception of irons, as mentioned above, has a place in more than 44 per cent. of the consumers' homes.

English Plant at a Newfoundland Development.—A great deal of English machinery figures in an important hydro-electric development which is nearing completion in the Humber Valley, Newfoundland. The undertaking is being carried out by Sir W. G. Armstrong, Whitworth & Co., Ltd., in connection with a large pulp and paper mills. The British Thomson-Houston Co., Ltd., is supplying the main generating plant, consisting of seven 10,250-kVA, 6,600-V, 3-phase alternators, designed to run at 375 r.p.m. The power is to be stepped up to 66,000 V for transmission to the main sub-station of the mills, Canadian General Electric transformers being employed. The B.T.H. Co. has also supplied seven 2,600-h.p., 2,200-V synchronous grinder motors, and two similar machines have been provided by Messrs. Crompton & Co., Ltd. Messrs. Ferguson, Pailin, Ltd., have supplied some of the switchgear, the main gear having been ordered from the B.T.-H. Co. A feature of the mills is the use of two 25,000-kW electric steam generators for heating the rolls of the newsprint machines. The output of the mills will be about 120,000 tons of newsprint per annum.

Indian Electrical Trade in April.—Our Indian correspondent says that the Indian trade figures for the month of April, 1925, show that the imports of electrical machinery into India during the month declined, and those of electrical instruments and apparatus considerably increased, as compared with the corresponding month of the previous year. Machinery imports amounted in value to Rs. 14¼ lacs, as against Rs. 19¼ lacs, while instruments and apparatus increased from 15 lacs to 23¾ lacs. The decline in the case of machinery has been mainly under the head "Meters," from 5 lacs to 2¼ lacs, and "Miscellaneous," from 7 lacs to 3¾ lacs; control and switchgear showed an increase from 4 lacs to 5 lacs. The United Kingdom's share decreased from 17¼ lacs to 13 lacs, but as imports from the United States have declined considerably, the percentage share of the United Kingdom shows a little improvement. Imports from Germany increased from Rs. 19,000 to Rs. 52,000, and those from Sweden from Rs. 3,000 to Rs. 16,000. Under "Electrical instruments and apparatus," the general increase of about 8 lacs has been mainly under the heads "Electric wires and cables," from 3 lacs to 8 lacs, and "Electric lamps," which increased from 1 lac to 2¼ lacs. The United Kingdom considerably improved its position, the value of its imports rising from 9 lacs to 17¼ lacs, the proportion being increased from 65 to 85 per cent. Germany and the United States both showed decreased trade.

New French Companies.—Among the new hydro-electric concerns lately formed in France are the Société des Forces Motrices de la Haute Creuse, with a capital of 3½ million francs, to acquire and work the Croix Blanche and Confolent stations at Moutier-Rozelle, in the Department of Creuze; and the Société des Forces Motrices de la Glane formed at Tulle with a capital of 5 million fr.

A new company has lately been formed in Paris (22 Rue Julie), with a capital of 100,000 fr. and the title La Société des Etablissements Kenotron to manufacture radio apparatus.

La Société de Distribution Rurale d'Energie Electrique is the name of a new company which has lately been formed at Ruffec, in the Department of Charente, with a capital of 1,200,000 fr.

Consumer-Ownership in Canada.—According to the *Financial Times*, the Shawinigan Water and Power Company has just completed a customer-ownership campaign, which has brought in 3,300 shareholders, making the total 7,700 shareholders, or an addition to the stockholders' list of 75 per cent. The total number of shares sold was approximately 12,000, representing a value of $1,600,000. A novel feature in connection with this campaign was that the company placed at the disposal of its customers common stock at $132 per share, instead of preferred stock, as is the practice in customer-ownership campaigns. The net yield on the investment at this price is 5.3 per cent. The terms were cash or deferred payments, and the average subscription was about 3¾ shares. This company was the first utility company in Canada to offer stock to its customers, and is the pioneer in the customer-ownership field.

Local Exhibition.—TAMWORTH.—On p. 124 we give some particulars of the undertaking of the Pooley Hall Colliery Co., Ltd., which supplies electricity in Tamworth, Staffs. Mention is made of an exhibition which was recently held there and a view of the display is reproduced. The following companies were among the exhibitors:—The Credenda Conduits Co., Ltd. (cooking equipment and domestic appliances); the British Thomson-Houston Co., Ltd. ("Mazda" lamps and lighting fittings for home, shop, and factory, "Tungar" rectifiers, fractional h.p. motors, and domestic apparatus); the General Electric Co., Ltd. ("Osram" lamps and lighting fittings, including the "Wembley" street-lighting lantern and colour-sprayed lamps, and electrical appliances for the home); the Western Electric Co., Ltd. (the "A.S." washing machine and an ironing machine, which were demonstrated, and various domestic apparatus); Metro-Vick Supplies, Ltd. (lighting fittings, fires, radio apparatus, &c.); the Siemens & English Electric Lamp Co., Ltd. (domestic appliances, the "Stannos" wiring system, and lighting fittings); the Tamworth Electrical Contracting Co. (various apparatus made by the leading electrical concerns); Hoover, Ltd. (vacuum cleaners); the Coventry Wireless Supplies, Ltd. (radio apparatus made by the principal British firms); and the Singer Sewing Machine Co., Ltd. (electrically-driven and lighted sewing machines).

Greek Power Contract.—Sealed tenders for the carrying out of power extension works in Athens, the Piræus, and the suburbs have just been opened by the Government, and have aroused great interest here. One was sent in by an Anglo-Greek group, consisting of the Power & Traction Finance Co., of London, allied with the principal Greek banks, headed by the National Bank, and with a guarantee for its proposals of £2,000,000 from the British Treasury, under the Trade Facilities Act. The only other competitor is the existing Greek Electrical Co.—*Reuter* (Athens).

The Rutenberg Concession.—The Bagdad correspondent of the *Financial Times* states that Baron Edmond de Rothschild has subscribed £100,000 to the Rutenberg electric power undertaking in Palestine, and that Mr. F. Worburg has promised to finance the scheme up to $500,000. The cost of the first stage of the scheme, which was the subject of a concession granted in 1921, was estimated at £750,000.

The Mulungushi Power Plant.—In the course of his speech at the recent annual meeting of the Bechuanaland Exploration Co., Ltd., the chairman (Mr. Edmund Davis) mentioned that the Mulungushi hydro-electric plant had been opened by the Prince of Wales. This plant has been erected by the Rhodesia Broken Hill Development Co. to provide power for its mine plant 39 miles away. The output capacity of the plant is 2,500 h.p. initially, but the site is capable of development up to 20,000 h.p. An artificial lake about 15 miles long and nearly four miles wide in places has been created for impounding the water against times of minimum flow.

A Canadian Telephone Contract.—The Manitoba Government Telephone Commission has recently awarded a contract for the installation of an automatic telephone exchange in the St. James's District of Winnipeg, to Messrs. Siemens Bros. (Canada), Ltd., a subsidiary company of Messrs. Siemens Bros. & Co., Ltd., of Woolwich. This firm installed the St. John's Exchange in Winnipeg in 1923. A considerable order for automatic dials and telephone instruments has been awarded to the same firm.—*Electrical News.*

Competition for Czecho-Slovakian Order. — The Witkowitz Iron Works Co. has placed the contract for a large steam turbine for its new electric power station with the Erster Brunner Maschinenfabrik of Brunn. Several English firms are reported to have competed for the order.

New Italian Companies.—A new company has lately been formed in Turin with a capital of 500,000 lire and the title La Società Fabbrica Accumulatori Elettrica.

The Società Collocamento e Lavorazione Telefoni Automatici "Scelta" has been formed in Milan, with a capital of 300,000 lire.

Among the new hydro-electric undertakings recently organised in Italy are the Società Idro-Elettrica di San Filippo, at Contigliana, capital 500,000 lire; the Società Idro-Elettrica dell' Isario, Rome, capital 100,000 lire; the Società Forze Idrauliche del Ceno, Barma, capital 90,000 lire; and the Società Forza Elettrichi Val Degagna, Milan, capital 200,000 lire.

A number of new concerns have lately been formed in connection with the radio industry in Italy.

Czecho-Slovakian Radio Exhibition.—Arrangements are in hand for the holding of a radio exhibition in Reichenberg from August 15th to 21st next.

Standardisation in Industry.—In the course of an address delivered at Leeds last week, Col. V. Willey, president of the Federation of British Industries, said that the growing adverse trade balance meant a decreasing amount available for foreign investment and as the latter always re-acted on exports, it was obvious that unemployment must increase. He said that industry in its present precarious state was not satisfied that the Government appreciated its critical condition. We as the premier manufacturing country were feeling most acutely the world trade shrinkage. Later, Col. Willey said (according to *The Times* report) that wastage in industry could be eliminated in an enormous number of ways. He would merely instance the possibilities of saving by standardisation. The present vast multiplicity of sizes, qualities, and specifications involved in their turn an immense cost in merchant stocks, in small unit transportation, and neglect of mass production possibilities. That was a tremendous field for possible economy. Let them imagine the saving in standardisation in hotel and institutional china, in plumbing supplies, paints and varnishes, in bolts and nuts, in bottles, wire fencing, timber. The idea that odd sizes gave the manufacturer competitive advantage was a fallacy. The only case where unlimited divergence seemed justified was in padlock keys. The Government could here well give a lead in standardising equipment for all Government Departments; but a determination of specification must be subsequent to the determination of standards in quality and dimension. By a Government lead in the simplification of business practices enormous saving to the taxpayer could be effected.

Swiss Firm to Finance an Austrian Company.—According to *Commerce Reports* the Salzburg Electric Company is constructing a 60,000-V transmission line in the Salzburg province. The company will be financed for this purpose by the Swiss firm, Aluminium A.G., of Neuhausen. The loan will not be made directly to the company but through the provincial Government. It is assumed that the Aluminium Company will supply the materials.

The Telephone Industry.—At a meeting of the Committee on Industry and Trade held last week at the Board of Trade, evidence was given on behalf of the Telephone Development Association by Mr. H. E. Powell-Jones, the secretary of the Association. After stating that the telephone manufacturing industry employed some 100,000 people, exclusive of 50,000 employed by the Post Office on telephone business, the witness pointed out that all the manufacturers could do was to create a demand and that they could not ensure that this demand was promptly satisfied. The principal cause, Mr. Powell-Jones stated, lay in the policy of annual revision of estimates, which made it difficult for the Post Office to lay down a programme in advance. The Association urged a policy whereby the probable requirements for a period of years should be ordered in advance. This policy would enable manufacturers to formulate a works programme and would result in employment being continuous instead of spasmodic. This should result in lower prices and more even quality, in addition to better deliveries. Further, it would assist manufacturers to tender more satisfactorily for contracts from abroad.

Golf Tournament.—A number of the principal members of the staff of the Automatic Telephone Manufacturing Co., Ltd., recently participated in a golf tournament. Messrs. H. W. Brooke and H. Adams reached the final, and the match was played off on the Bowring Park Municipal Golf Course, Liverpool, on July 10th. Mr. Adams received five strokes but was defeated after a very level game.

Swedish Wiring Practice.—An article on this subject recently appeared in *Commerce Reports*. It is stated that Swedish wiring practice conforms closely to the German methods. In the better-class buildings Bergmann or other forms of tubing are used; in many other buildings wiring on porcelain cleats is adopted. When lead-covered cables are used they are required to be armoured. Rotary and push-button switches are generally employed, although tumbler switches are used to some extent. The fuses are mainly of the Edison screw plug or the German "Diazed" types; cartridge-type, open-link and thumb-grip fuses are not employed. Edison screw sockets are general, the bayonet type being almost unknown.

For Sale.—Manchester Corporation Electricity Department invites offers for surplus electrical instruments, &c., including ammeters, voltmeters, relays, &c. Hastings Corporation Electricity and Public Lighting Committee has for disposal surplus generating plant consisting of steam turbines, alternators, boilers, cooling towers, &c. (See our advertisement pages to-day.)

Strike at Lochaber. — Work upon the Lochaber hydro-electric scheme was held up last week by a strike of carpenters and joiners, about 1,000 in all. The dispute originated with the dismissal by the contractors, Messrs. Balfour, Beatty and Co., of a joiners' shop steward. The strike lasted a day and the men decided to return to work pending negotiations.

German Activity in Italy.—In a review of a report upon the situation in Italy during the past year, the *Board of Trade Journal* says that Italian factory production itself is developing year by year and is becoming a formidable competitor with the goods of other countries. For the business available to foreigners Germany is a severe competitor. A feature of the year has been an intensive canvassing campaign on the part of German representatives on an even larger scale than before. These representatives speak Italian and know the country intimately, carry price lists in Italian, and are able to show complete collections of samples from which all traces of their origin have been removed. Prices are now quoted in lire. It is thought that no other country could contemplate competition with these representatives on anything like the same scale and it is doubtful whether the market would furnish sufficient orders to pay any other country to follow in the German's footsteps; yet it is a fact that they are reaping the fruits of their initiative.

Spanish Hydro-Electric Development.—The Seville Electric Co., of Seville, which controls the hydro-electric facilities throughout South-west Andalusia, has announced that it intends to issue a 6 per cent. loan to the amount of 10,000,000 pesetas for the carrying out of a large programme of hydro-electric extension involving the purchase of foreign equipment.

British Trade-mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 15th:—

Eos. No. 456,449. Class 4. Electric and galvanic carbons.—The firm trading as C. Conradty, 9, Spittlertorgraben, Nuremburg, Germany. British representative: S. Sokal, 1, Great James Street, Bedford Row, W.C.1.

Pixie Grippa. No. 459,076. All goods in class 8.—Perophone, Ltd. 76-78, City Road, E.C.1.

Eddystone (lettering and design). No. 456,158. Class 8. Instruments and apparatus, and parts thereof, for use in radio-telephony and telegraphy, but not including electric batteries and cells, nor goods of a like nature.—James Rainsford & Laughton, Ltd., Alexandra Works, Kent Street, Birmingham.

Design only. No. 458,840. All goods in class 8.—Chinn's Patents, Ltd., 33, Brazennose Street, Manchester.

Icall. No. 448,364. Class 11. Electrolysis outfits, electric massage vibrators, air douches, radiant heat lamps, &c.—I. Calvete, Ltd., 11, Little St. Andrew Street, W.C.2.

Lumina. No. 459,539. Class 13. Sparking plugs for internal-combustion engines.—A. E. Macdonald, 5, St. John's Road, Golder's Green, N.W.4.

Memite. No. 459,287. Class 50. Electrical insulating materials.—The Midland Electrical Manufacturing Co., Ltd., Barford Street, Birmingham.

Amplifying Equipment at St. Peter's.—MESSRS. ALFRED GRAHAM & CO., LTD., have received a letter from Signor Federico Mannucci, the chief engineer of the Vatican, congratulating them upon the success of the amplifying equipment installed by them for the recent imposing ceremonies in St. Peter's Cathedral, Rome. It is stated in the letter that the apparatus enabled a huge assembly of 30,000 persons to hear every word of the ceremonies.

Proposed Municipal Showrooms.—The Loughborough Town Council proposes to open a showroom in connection with the Electricity Department, and shop premises are being inspected for the purpose.

Czecho-Slovakian Radio Regulations.—The importation of radio apparatus into Czecho-Slovakia is subject to a licence granted by the Ministry of Commerce, jointly with the Posts and Telegraphs Department. To obtain a licence manufacturers or their agents are required to submit drawings or a sample of the apparatus which it is desired to import. The use of reaction is prohibited by the Government.

Lead.—Messrs. James Forster & Co. report under date July 18th:—"Considering that demand from consumers this week was quiet and a general strike is threatened, the market shows a remarkably firm front. All lead arriving is quickly absorbed, and it is estimated in some quarters that there is an average consumption of lead in this country of 21,000 tons a month, an increase of from 3,000 to 4,000 tons a month over last year. In Germany, also, there has been a large increase, the average monthly imports this year of 14,000 tons being over 100 per cent. higher than during the same period of last year. This would mean a total increase in the United Kingdom and Germany of about 120,000 tons a year, apart from any increase in the United States, where consumption is running at a high level. If this rate is maintained, we can see nothing for it but still higher prices for lead, for, although production is increasing, it is not doing so to nearly the same extent. The Board of Trade returns show as follows:—May: Imports, 23,962 tons; exports, 3,678 tons; leaving 20,284 tons. June: Imports, 19,400 tons; exports, 2,278 tons; leaving 17,122 tons."

Social Event.—The staff and employés of Messrs. Macdonald, Syer & Co., Ltd., held their annual outing on July 11th. The *venue* was Southend and lunch was taken at the Palace Hotel, Mr. C. Stanley Syer presiding.

Chinese Notes.—The Yung Ming Electric Lamp Factory has recently commenced operations in Shanghai. The company has installed German machinery; its lamps bear the trade mark "Klasun."

The Mukden authorities are considering the installation of a long-distance telephone service between Tientsin and Shanghai. The line will be erected in four sections, *viz.*, Tientsin-Tsinan, Tsinan-Hsuchow, Hsuchow-Pukow, and Nanking-Shanghai. A cable will be laid in the Yangtze River to connect Pukow and Nanking. The total length of the line will be over 2,900 li (970 miles), and its cost is estimated at between 1½ and 2 million dollars.

The Yalukiang Electrical & Water Supply Co., a Sino-Japanese concern, is being organised with a capital of 6,000,000 yen to supply electricity and water in Antung.

An electric lighting company commenced operations at Yutse (Shansi) in May with a capital of $30,000.

The Shihkiachwang Telephone Service Co. has been registered in the Chihli province with a capital of $50,000. Another company to provide telephone service at Tsanghsien, in the same province, is being organised.

Proposed Large Canadian Aluminium Plant.—The *Electrical News* (Toronto) reports that the approval of the Provincial Government of Quebec has been given to the development of 600,000 h.p. near the Saguenay River. The power will be employed in a large aluminium producing plant which is to be erected by a group controlled by Mr. J. B. Duke, the American magnate, and Mr. E. H. Davies, who controls one of the largest aluminium companies in the world. The expenditure involved is estimated at between 75 and 90 million dollars.

Lighting and Power Notes.

Ashton-under-Lyne.—NEW CHARGES.—The Electricity Committee has recommended that the rateable value system of charging for domestic supplies be adopted, based on an annual fixed charge of 15 per cent. of the net rateable value of the house plus ½d. per kWh for all purposes; also that the scale of charges for three-phase energy to large consumers be varied by increasing the basic price of coal from 10s. per ton to 12s. delivered at the generating station, the increases over 12s. to be 0.02d. per kWh for each 1s., and proportionately for fractions of 1s.

Barnes.—BULK SUPPLIES.—The Urban District Council has now received quotations from neighbouring authorities for a bulk supply of electricity and is comparing them with the cost of extending the Barnes works.

Bedford.—EXTENSION OF OFFICES.—The Electricity Committee recommends the provision of new office accommodation by remodelling and extending the existing offices at a cost of £2,750.

APPLICATION FOR LOAN.—The Town Council has applied for a loan of £30,000 for electricity purposes.

Belgian Congo.—NEW SUPPLY COMPANY.—Under an agreement between the Société Union Minière and the Société Electricité et Traction, of Brussels, a new company is being formed with a capital of 75 million francs and the title La Société Générale des Forces Hydro-Electrique du Katanga to establish a plant to utilise the water power of the Lufia Falls in the Belgian Congo, for the supply of electricity to the mines of the Union Minière. Under the terms of the agreement the last-named concern will have the right to purchase the electrical undertaking at the end of 30 years on the basis of the profits during the preceding seven years.

Birmingham.—ALL-ELECTRIC HOUSES.—Two experimental houses now being erected at Bournville are to be equipped throughout for both heating and lighting by electricity. Only one fire grate is being put into each house, and it is estimated that this will make a saving of £20 on the equipment expenses.

Bradford.—MAINS EXTENSIONS.—The Electricity Committee has sanctioned an expenditure of £20,000 on mains extensions.

LOAN SANCTIONED.—The Committee has obtained sanction to borrow £1,724 in connection with the provision of an e.h.p feeder from the Valley Road works to Bolton Road sub-station

SUPPLY TO SHIPLEY.—The Committee has come to terms with the Yorkshire Electric Power Co. with respect to a bulk supply of electricity to the Shipley U.D.C.

NEW PLANT.—The new 20,000-kW turbo-generator is expected to be ready for work in two months' time.

Brecon.—OBJECTION TO ELECTRICITY ORDER.—The Brecon Gas Co. has lodged an objection to the Council's application for a Special Order for the supply of electricity.

Carlisle.—MAINS EXTENSIONS.—The Unemployment Grants Committee has agreed to the scheme of the Electricity Committee for laying electricity mains in various streets at a cost of £7,957.

LOAN SANCTIONED.—The Electricity Committee has received sanction to borrow £5,000 for electricity purposes.

Chard.—PROPOSED CONFERENCE.—The Town Council has received a communication from the Axminster Rural District Council to the effect that the promoters of the Axminster electricity scheme would be pleased to confer with the Chard Town Council to see whether any agreement could be arrived at for removing the objections to the scheme.

Chester.—OVERHEAD TO OUTLYING DISTRICTS.—Overhead transmission lines are being erected to form a belt at a distance of about four miles from the city of Chester. In this way an area of about 70 square miles will be supplied with energy.

Northern Ireland.—COLERAINE.—The Rural District Council is considering an application from the Coleraine Urban Council to obtain powers for the supply of electricity in the rural district.

Colwall.—ELECTRICITY SUPPLY.—The Hereford Corporation has assented to the Malvern Council's seeking powers to afford a supply of electricity to Colwall. The Malvern Council undertakes that the charges shall not exceed 20 per cent. of the rates in force at Malvern.

Continental.—SPAIN.—The Riegos Fuerza del Ebro (a Pearson enterprise) is considering a gigantic development of its plant. If this project is carried out the company will be able to provide all the electric power necessary for Catalonia, but the work would entail enormous expenditure and a long time would elapse before its completion.

According to an industrial map of the province lately issued by the Barcelona Chamber of Industry, water power to the extent of 326,175 h.p. is now being utilised in Catalonia. The major portion—268,813 h.p.—is used for hydro-electric purposes.

FRANCE.—The Société Biterroise de Force et de Lumière has lately completed the erection of a 30,000-V transmission line between Plaissan and Beziers. The company has also entered into an agreement with the Société Pyrenéenne d'Energie Electrique for the establishment of a second transmission line between the power station at Luzieres of the Société des Forces Motrices de l'Agout and Beziers.

East Morton.—ELECTRICITY SUPPLY.—An offer by the Bingley Council to supply electricity to East Morton at the price charged in Bingley, plus 7½ per cent., was accepted, and support will be given to Bingley's application for an order to supply electricity in the district.

Edinburgh.—PROPOSED EXTENSIONS.—Important proposals for the extension of the Portobello electricity station are being considered by the Corporation Electricity Committee. The estimated cost is £400,000. It is recommended that the work of the building extensions should be proceeded with at once, a decision to be reached later regarding the extent of the generating plant which would be required.

LIGHTING OF HOUSING AREAS.—The Corporation Lighting Sub-Committee recommend that provision be made in the estimates for additional lighting in housing areas and for increasing the wattage of electric lamps where this is unsatisfactory. The cost of the proposed extension is £2,067.

East Ham.—CABLE EXTENSIONS.—The Electricity Committee has prepared a scheme for cable extensions at a cost of £4,751; it has also obtained sanction to borrow £1,199 for the extension of distributor mains.

Faversham.—CORRECTION.—The new plant at the electricity works includes two Vickers-Petters heavy oil engines of 320 b.h.p. each, and not two Browett-Lindley engines, as stated in our issue of July 17th.

Great Yarmouth.—YEAR'S WORKING.—The results of the year's working (1924-5) of the electricity undertaking (engineer: Mr. P. G. Campling) show an income of £48,953, as compared with £51,598 for the preceding year. The working expenses were £28,179, against £33,308, leaving a gross profit of £20,774 (£18,289). After deducting the capital charges, &c., a net surplus of £2,136 is shown, against £2,123 for 1923-4. During the 15 months ended March 31st, 1925, the sales amounted to 3,563,532 kWh.

Gloucestershire. — OPPOSITION TO APPLICATIONS. — The County Council has decided to oppose the Gloucester application for extended powers for the supply of electricity, also the Cheltenham application and those of the Avon Valley Company and the West Gloucestershire Power Company.

Hamilton. — ACQUISITION OF UNDERTAKING. — The Town Council has adopted a recommendation by the Electric Lighting Committee to acquire the electric light undertaking from Messrs. Edmundsons from January 1st next. The committee is to meet the general manager to complete the negotiations.

Hathern.—BULK SUPPLY.—The village is to receive a supply of electricity from the Loughborough electricity works. It is proposed to erect overhead cables (2,800 yards) at an approximate cost of £1 3s. 3d. per yard in the main streets and 19s. 5½d. per yard in the side streets.

Ilkeston.—SUPPLY POWERS.—The Corporation has now received powers to supply electricity to various places in the district.

India.—CALCUTTA.—The new power house of the Calcutta Electric Supply Corporation, which is in course of construction, will be started with two 6,000-kW turbo-generators and three 50,000-lb. boilers. Ultimately it will be possible to increase the capacity of the generating station to 100,000 kW. It is understood that the station will be ready for running in September, 1926.

Japan.—RESERVE PLANT.—It is reported from Tokio that a law has been enacted requiring all hydro-electric power stations in Japan to be provided with a reserve steam plant capable of producing 10 per cent. of the normal output.

Keighley.—DISTRIBUTION CONFERENCE.—A conference of local authorities is being called by the Town Council to discuss questions affecting the distribution of electricity in the north-western portion of the West Riding of Yorkshire.

Liverpool.—STREET LIGHTING.—More than seven miles of thoroughfares in Liverpool have been converted from gas to electric lighting during the past twelve months and the Electric Power and Lighting Committee is carrying out a scheme to illuminate every city street with electricity.

Northampton.—HOSPITAL INSTALLATION.—The Northamptonshire County Council has decided to install electric light and power at the Barry Wood Mental Hospital at a cost of £4 750.

Penang.—YEAR'S WORKING.—We have received a report on the working for the year ended December, 1924, of the Electricity Supply Department (engineer and manager, Mr. W. J. Williams). The income was £91,555 and the working expenses amounted to £63,461, leaving a gross profit of £28,094. After deducting capital charges, &c. the net surplus amounts to £6,462. The capital expenditure during the year amounted to £118,905, making a total of £467,496.

Preston, Blackburn, and Blackpool.—APPLICATIONS RECOMMENDED.—The Electricity Advisory Board for Mid-Lancashire has decided to recommend to the Commissioners that applications by the Preston, Blackburn, and Blackpool Corporations for permission to develop their electricity undertakings be granted.

Portsmouth.—YEAR'S WORKING.—The statement of accounts of the electricity undertaking for the year ended March 31st last shows a total income for the year of £151,572, against £130,054 in the preceding year. The working expenses are recorded as £99,224, against £79,705, leaving a gross profit of £52,347 (£50,348). Deduction of the capital charges &c., leaves a net surplus of £14,574, compared with £17,904 for the year 1923-4. The capital expenditure for the year was £111,086, including £68,762 spent on mains, making a total of £748,087. The total kWh sold during the period amounted to 10,262,205, while the maximum demand was 7,000 kW. The bulk sales totalled 458,088 kWh.

EXTENSION OF GENERATING STATION.—The Electricity Committee has received consent to extend the generating station.

LOAN SANCTIONED.—The Town Council has received sanction to a loan of £14,900 in connection with the scheme for supplying electricity to Hayling Island.

APPLICATION FOR LOAN.—Application is to be immediately made for sanction to borrow £35,000 for mains to be laid in the areas first to be supplied under the Special Order for extensions which has been granted.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

AYRSHIRE.—Private lighting: First 1,000 kWh per quarter to 6d. per kWh; beyond this figure 5½d. per kWh; 4½d. per kWh, with a minimum guarantee of 20,000 kWh per annum. Power (l.p.): First 5,000 kWh per annum, 2½d., the next 5,000 kWh, 2d., 1½d. for a further 5,000 kWh, 1½d. for the next 5,000 kWh, and 1d. for all beyond. Maximum demand: £6 per kW plus 0.5d. per kWh up to 150 kW, £5 10s. plus 0.5d. up to 200 kW, £5 plus 0.5d. up to 250 kW, £5 plus 0.4d. up to 300 kW, and above this £5 plus 0.3d. Domestic heating: To 1½d. per kWh.

WEYBRIDGE.—10d. per kWh for the first 100 kWh per quarter and 9d. per kWh beyond.

SWANSEA.—Lighting: Flat rate from 6d. to 5½d. per unit; maximum demand system: The war increase reduced from 40 to 20 per cent. Power: The war increase reduced from 25 to 12½ per cent. Heating and cooking: Winter quarters from 2d. per kWh to 1½d. per kWh. Meter rent: By 50 per cent.

BEDFORD.—Cooker hire charges: From 10s. per quarter to 7s. 6d. in respect of large cookers, and from 8s. 6d. to 6s. 6d. in respect of smaller cookers.

HARROGATE.—Lighting: By 1d. per kWh. Heating: By ½d. per kWh. Power: To 4d. for the first 116 kWh per h.p. per quarter.

EXETER.—Lighting: To 5½d. per kWh. Heating: To 2d. per kWh. Power: To 1½d. per kWh.

BARNES.—Rateable value system: To one penny per kWh throughout the year, meter rents to be reduced by 1s.

GRAYS.—Lighting: For first 1,000 kWh per quarter 7d., next 1,500 6d., beyond 5d.; prepayment meters, 8d. Power and heating: For first 500 kWh 3d., next 3,500 2½d., beyond 2d. Outside shop lighting, 5½d. Cooking: If cooker is purchased, 1½d.; cooker hired, through separate quarterly meter, 1½d; cooker hired, through separate prepayment meter, 2d., with a rebate of 1d. in each 1s. collected; cooker purchased, through separate prepayment meter, 2d., with a rebate of 2d. in each 1s. collected.

FLEETWOOD.—Reduction of over 10 per cent. on previous charges. Lighting: First 200 kWh per quarter, 6½d. per kWh; 201 to 400, 6d.; 401 to 600, 5½d.; 601 to 1,000, 5d.; 1,001 to 1,500, 4½d.; over 1,500, 4d.; prepayment meters, 8½d. per kWh and 2d. in 1s. discount. Power: Up to 2,000 kWh per quarter, first 500 kWh at 2½d., remainder 1½d.; over 2,000 and up to 5,000, a flat rate of 1½d.; over 5,000 a sliding scale from 1½d. to 1d. at 30,000, subject to coal clause for consumption of over 5,000 kWh per quarter. Heating and cooking purposes: A flat rate of 1½d. Discount to Railway Company to be increased from 5 per cent. to 7½ per cent.

Rawtenstall.—APPLICATION FOR LOAN.—The Town Council is to apply for sanction to borrow £32,000 for the purchase of a 6,000-kilowatt turbo-alternator and the necessary equipment for extensions to the Corporation electricity works at Hareholme.

Ryde.—NEW CHARGES.—The Ministry of Transport has made an order authorising the Isle of Wight Electric Light and Power Co. to make the following charges for electricity as from July 1st:—Winter quarters: For any amount up to 15 kWh, 12s. 6d., and beyond, 10d. per kWh. Summer quarters: Any amount up to 10 kWh, 8s. 4d.; and 10d. per kWh beyond.

Saltburn-on-Sea.—NON-PURCHASE DECISION.—The Urban Council has affirmed its previous decision not to purchase the electricity undertaking supplying the town.

Sheffield.—YEAR'S WORKING.—The statement of accounts for the year ended March 31st, 1925, for the electricity supply undertaking (engineer, Mr. S. E. Fedden), shows a working expenditure of £368,994, against £297,729 for the previous year. The income amounted to £813,024, compared with £808,946, resulting in a gross profit of £444,030 (£511,217). After deducting the capital charges, &c., the net surplus stands at £147,510, against £201,411 for 1923-4. The capital expenditure for the year amounted to £149,406, making a total of £4,015,892; £131,792 was expended on sub-station buildings and mains. The average price per kWh during the year was 1.186d. The kWh sold increased by 2,568,316, or 1.7 per cent. The maximum demand for the year was 229,092 kW.

South Devon.—SUPPLY INQUIRY.—The Electricity Commissioners have appointed Col. Ekin, of the Ministry of Transport, to conduct an inquiry regarding proposals to supply electricity over a wide rural area in South Devon. This area extends from Prawle Point to Teignmouth on one side and Moretonhampstead on the other. The Teignmouth Electric Lighting Company has asked for powers respecting part of this area, including Kingsteighton, Bishopsteighton, Bovey Tracey, Teigngrace, Trusham, and Heathfield.

Southend.—NEW PLANT INQUIRY.—Col. T. C. Ekin, M.Inst.C.E., representing the Electricity Commissioners, opened an inquiry at the Clarence Hall, Southend, on July 14th, into the application of the Town Council to borrow over £75,000 for new plant and the conversion of the system of distribution. The principal witnesses were Mr. W. H. Patchell and Mr. R. Birkett, the borough electrical engineer. The latter gentleman spent some 6¼ hours in the witness-box, and was mercilessly cross-examined for some time, says the *Southend Times*, on matters contained in the report of the late Mr. C. H. Wordingham. The figure referred to includes £40,000 in respect of new plant; £7,100 and £2,980 in respect of expenditure in excess of grants on previous sanction; and £25,000 for the purpose of laying a.c. mains, &c.

Southwick.—ELECTRICITY SUPPLY.—Considerable progress has been made with the laying of feeders to supply this area from the Brighton electricity undertaking, and it is hoped that the supply will be available in time for the next lighting season.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation, Special Orders made by them for the supply of electricity in the following districts:—The County Palatine of Lancaster, by the Urban District Council of Ashton-in-Makerfield; the rural district of Whitchurch in the county of Southampton, by the Whitchurch and District Gas Company, Ltd.; also a Special Order made by them authorising the London Electric Supply Corporation, Ltd., to supply the Southern Railway Co. with electricity to be used for purposes incidental to the working or lighting of certain railways.

Application is being made by the Darlington Corporation to supply electricity in the rural districts of Darlington and Croft.

The Urban Council of Dartford has decided to apply for a Special Order to supply electricity to the parish of Stone.

Stockton.—MAINS EXTENSIONS.—The Electricity Committee has agreed in principle to the laying of a new h.p. main from the works to the Dinham Road area, and the erection of an outdoor sub-station, at an estimated cost of £5,500. The electrical engineer is to report further on the matter later.

Strood (Kent).—ELECTRICITY IN BULK.—The Rural Council has decided not to accede to an application by the County of London Electric Supply Co., for an order to supply electricity in bulk by mains to be laid between Barking and Rochester.

Swansea.—MAINS EXTENSIONS.—The Electricity Committee has decided to lay electricity mains in various roads at a cost of £55,000, and to borrow £50,000 for prospective extensions to mains and house services.

Torquay.—APPLICATION FOR ORDER.—Subject to the disposal of an application by a private company for an Order to supply energy in an adjoining area, the Torquay Corporation proposes to apply for an Order for powers to supply outside its area, which would then enable negotiations to proceed with Edmundsons' Electricity Corporation, Ltd., for a supply in bulk to other districts. It is suggested that such a supply could be given to Dartmouth.

OVERHEAD LINES.—The Electricity Committee has obtained the consent of the Ministry of Transport to the erection of overhead lines to supply electricity at Kingskerswell.

Truro.—ELECTRICITY SUPPLY.—The Truro Corporation has accepted the offer of Messrs. Edmundsons' Electricity Corporation, Ltd., to supply electricity to the city, subject to provisions that the maximum price charged shall not exceed 10d. per unit for lighting and 5d. per unit for power, and that the company shall undertake to adopt as soon as possible the proposed Government standard periodicity.

Warwick.—NEW CABLE FEEDER.—The Leicestershire and Warwickshire Electric Power Co. is to lay a cable from the power station at Warwick to Coventry.

Watford.—PLANT EXTENSIONS.—The Electricity Committee has decided to ask for permission to install a 5,000-kW turbo-alternator and a 30,000-lb. water-tube boiler at the electricity works.

West Thurrock.—PUBLIC LIGHTING.—The Parish Council has accepted the offer of the County of London Electricity Supply Co. for public lighting at £3 7s. 6d. per 100-watt lamp. The total cost of lighting will be £351 18s. 6d., against £414 5s. 9d., the estimated cost of gas lighting.

Woking.—EXTENSION TO POWER STATION.—The Woking Electric Supply Co. are to enlarge their power station at the junction of Board School Road and North Road.

Wrexham.—OBJECTION TO BULK SUPPLY SCHEME.—The Wrexham Rural District Council has decided to make a formal objection to the application of the Wrexham Corporation for powers to distribute electrical energy within parts of the rural district.

Worcester.—APPLICATION FOR LOAN.—The City Council has applied to the Electricity Commissioners for a loan of £33,300 to carry out the first instalment of a scheme under the Electricity Extension Order.

Tramway and Railway Notes.

Argentina.—BUENOS AIRES.—Plans are under consideration for an underground electric railway in Buenos Aires to connect the Retiro railway station in the North with several important suburbs in the southern part of the city.

Bradford.—NEW TRAM TRACK.—The City Council has decided to re-lay the tramway track from the junction at Eccleshill to Five Lane Ends, after considering the installation of a railless car system.

Continental.—AUSTRIA.—Austria will, within the next three years, electrify an additional 300 kilometres of its railways, and will purchase upward of 70 electric locomotives. A total of $18,000,000, part of the remaining proceeds of the International Loan for Austria, recently released for this purpose by the League of Nations finance committee, will be used to finance this electrification.—*Commerce Reports.*

ITALY.—Work has lately been completed on the electrification of the railway between Genoa and Sestri Levante.

A new electric railway has lately been completed and opened for traffic between Bribano and Agordo, a distance of about 17¾ miles.

FRANCE.—The Midi Railway has prepared plans for a projected electric railway to the summit of the Pic du Midi de Bigorre, which has an altitude of 9,435 ft.

Work has been practically completed on the electrification of the Midi railway between Montrejean and Luchon, a distance of 22¼ miles.

SWITZERLAND.—Such good progress is being made with the electrification of the Olten-Berne section of the Swiss Federal railways that it is expected the work will be completed a month or two before the date specified in 1923, *i.e.*, by the end of 1925. This will enable work on the electrification of the Pratteln-Erigue line to be started somewhat earlier than was anticipated.

Dudley.—TRAMWAY ABANDONMENT.—The Ministry of Transport has sanctioned the abandonment of the tramway track from Dudley to Kingswood.

Java.—ELECTRIFIED STATE RAILWAYS.—The first electrified section of the Java State railway has recently been completed and opened for traffic. It is about 10 miles in length and runs from Batavia to Tandjong Priok. The power is transmitted at 7,000 volts from a hydro-electric station about 60 miles away, the current being converted to 1,650 V. d.c., at two sub-stations in Batavia.

Middlesbrough.—YEAR'S WORKING.—A progress table for the tramway and 'bus undertakings shows for the former a gross income for the year 1924-5 of £67,343, against £64,547 for the previous year. The working costs amounted to £48,493, against £45,245, leaving a gross profit of £18,850 (£19,302). The reduction of capital charges, &c., leaves a deficit of £4,316 against £3,848 for 1923-4. The car mileage for the year was 718,854, compared with 667,976 for the preceding year. There was a deficit of £3,414 on the 'bus services.

Penang.—YEAR'S WORKING.—The accounts for the year ended December 31st last of the Tramway Department (engineer and manager, Mr. W. J. Williams) record a total expenditure of £22,971 and an income of £27,923, leaving a gross profit of £4,952. The net result after deducting capital charges, &c., was £470 profit. The capital expenditure during the year was £4,579. The accounts for the 'buses and railless cars are both included in the above.

Southport.—YEAR'S WORKING.—We have received a copy of the annual report for the year ended March 31st last, on the working of the Tramway Department (general manager, Mr. T. J. Kendrew). The revenue is shown as £76,627, against £70,841 for the preceding year. The working costs amounted to £52,365, against £48,703, leaving a gross profit of £24,261 (£22,137). After deducting capital charges, &c., a net surplus of £4,401 is shown. The car miles run during the year reached a record figure of 1,015,969, an increase of 873,110.

Sunderland.—TRAMWAY REPLACED BY 'BUSES.—The Sunderland District Tramways Company has withdrawn the last of its tramway services and the track is being pulled up. The company has substituted motor-'buses for tramways, and has 58 'buses operating on eight separate routes in the Houghton-le-Spring-Durham-Sunderland area.

Swansea.—TRACK IMPROVEMENTS.—The Corporation has agreed to advance £25 000 to the Swansea Tramway Co. for doubling and improving the tramway track.

Walsall.—YEAR'S WORKING.—The accounts for the tramway way undertaking (engineer and general manager, Mr. C. Burgess) for the year ended March 31st, 1925, show a total income of £78,690 as compared with £76,315 for the previous year. The total working expenses were £55,285 against £57,378, leaving a gross surplus of £23,404 (£18,937). The capital charges for the year amounted to £13,109, which, after adding income from other sources, leaves a net profit of £10,877, as compared with £5,242 for 1923-24. The car miles run during the year increased from 901,580 to 933,143, and the number of passengers carried was 11,373,512, compared with 10,744,392 for the preceding year.

Telegraph and Telephone Notes.

Belgium.—ANGLO-GERMAN TELEGRAPHIC COMMUNICATION.—A meeting attended by three Ministers and officials connected with the Belgian Telegraph Administration was held on July 18th at Brussels for examining anew the installation of a cable from La Panne, on the Belgian coast, to Herbesthal, on the Belgo-German frontier. This cable is intended to assure direct telegraph communication between England and Germany, which is best served by way of Belgium. The present Belgian installations are unable to cope with the traffic, a large part of which is transmitted *via* Holland. The projected cable is estimated to cost one hundred million francs [about £950,000 at present rates]. It was suggested that the best solution would be for the work to be done by Germany under the head of reparations.—*The Times.*

India.—TELEPHONE TRAIN CONTROL.—The installation of telephone train control by the B.B. & C.I. Railway Co. has removed much of the cause of delays in running time which were so frequently experienced before its adoption, and again further relief was afforded when a system of track-circuiting was introduced extending over the section between Colaba and Bandra stations. These improvements have had the effect of enhancing the operating efficiency of the service in that 40 per cent. increase in the number of train movements per diem has been made possible.

Italy.—AUTOMATIC TELEPHONY.—An automatic telephone exchange on the Western Electric Co.'s system has recently been completed in Naples.

Mexico.—AUTOMATIC TELEPHONY.—According to *Commerce Reports* the Mexican Telephone & Telegraph Co., which was established 37 years ago and now has 32,000 miles of line in 10 Mexican States, has been granted a concession by the Congress of the State of Tamaulipas to install an automatic telephone system in Tampico. Several small lines in the State of Tamaulipas will be taken over, consolidated, and ultimately connected with existing lines. Work must be begun within eight months of the approval of the plans, and the company is obligated to have its lines into Matamoros within four years.

Postmaster-General's Statement. — In the House of Commons on July 20th the Postmaster-General (Sir W. Mitchell-Thomson) reviewed the working of the postal, telegraph, and telephone services during the past year. He said that the position with regard to telegraphs continued to be unsatisfactory; the service had incurred a deficit of £1,330,000. This was attributed to the competition of the telephone service. The latter service continued to make steady progress. In spite of the reductions in the fees, there had been a surplus of £865,000; it was expected that the further reductions which had been made would reduce the current year's surplus to £500,000. The Postmaster-General refrained from going into great detail regarding the telephones as he proposed shortly to introduce a Bill to make provision for capital expenditure upon the telephone service over a series of years. He made special mention of the increasing use of automatic telephony and to telephone communication with the Continent.

Referring to broadcasting, he said that the arrangements for the appointment of a Committee to study the whole matter were well in hand.

Dealing with Imperial radio communication, Sir W. Mitchell-Thomson said that the stations for communication with Canada and South Africa were due to be completed in October, and the sending and receiving stations for India and Australia were to be ready within nine months. It had been provisionally agreed that the Marconi Co. should be licensed to serve the following European countries, in addition to countries outside Europe:—Austria, Bulgaria, Denmark, Finland, France, Greece, Portugal, Russia, Spain, Sweden, Switzerland, Turkey, and Jugo-Slavia.

Radio at Sea.—SHIP-SHORE SERVICE BANNED.—The G.P.O. has declined permission to the Cunard Co. to install a wireless telephone station at Liverpool as a medium of communication with its liners at sea. The White Star Line experimented twelve months ago with a wireless telephone service by which it hoped to establish regular connection between its ships at sea and Cherbough, but it was found that, principally owing to interference from other wireless services, the scheme was not a success. It is understood that a representative of the Marconi Company will visit Liverpool shortly to discuss details of new experiments.

Shetland Islands.—TELEPHONE SERVICE.—Telephone development has reached even the distant Shetlands. This month sees Lerwick equipped with a new telephone exchange with a manual switchboard, and a continuous service instead of just a daytime one as hitherto.

The Telephone Service.—RE-NAMING EXCHANGES.—By the time the next issue of the London telephone directory is in the hands of subscribers, there will be three further changes in exchange names, yet another step towards the introduction of automatic telephones: East Ham will be re-named Grangewood, Woodford will become Buckhurst, and Kingsbury will change to Colindale. Single digit telephone numbers will disappear, and big business houses will have four digit numbers instead of the familiar No. 1. The practice of calling for certain commercial exchanges by name only will cease and "Lloyd's" and "Baltic" will henceforth be known by numbers.

Radio Notes.

The B.B. Co..—PROGRAMME PLANS.—Lord Gainford, chairman of the B.B.C., at the second general meeting of the company, claimed that there is still great evasion in spite of 1,371,581 licences having been issued up to June, an increase of 567,000 during the year. "Not only is our present income not large enough," he said, "but even if and when the number of licensed listeners increases to 2,000,000 the income derived will not secure the standard of service which we desire to attain." Out of £666,000 received for licences during 2¼ years to March 31st, 1925, £612,000 has been spent in programmes, leaving a surplus of £54,000. It is essential to provide more alternative programmes than are at present possible to the great majority of listeners, and proposed improvements involve an expenditure of approximately £100,000. An income of £500,000 is expected from licenses next year, which will be spent on programmes. Lord Gainford emphasised that 85.37 per cent. of expenditure has thus been incurred on programmes, only 6.38 per cent. on administration (head office administrative salaries and wages, general expenses, directors' remuneration, &c.), and the balance of 8.25 per cent. on depreciation.

France.—RADIO LEAGUE.—An organisation open to all persons interested in radio communication in France has been formed at a meeting in Paris. This "National Federation of Wireless Clubs" represents the great majority of the 600,000 radio amateurs in France, and will deal with all questions of interest to listeners. M. Foveau de Courmelles was elected president, and vice-presidents were chosen for each district of France. Technical and juridical advisers were also appointed. —*Reuter* (Paris).

Germany.—SHORT-WAVES.—It is reported that the German Postal Ministry has decided to permit amateur broadcasting on short wave-lengths.

New Zealand.—NEW STATIONS.—The Christchurch correspondent of the *Daily Mail* reports that the Government and a new broadcasting company have agreed to the erection of modern 500-watt broadcasting stations at Auckland, Wellington, Christchurch, and Dunedin.

Rumania.—RADIO LAW.—The Department of Overseas Trade has sent us a translation of the "Law for the installation and use of Radioelectric Posts and Stations" in Rumania which has been received from the commercial secretary at Bucharest. The regulations were published on July 8th and they provide, *inter alia*, that the right of exploitation of broadcasting in Rumania belongs to the State, and may be carried out either through the General Post Office or through a limited company which will have the sole right of broadcasting. The State will contribute to the company 60 per cent. of the capital and will have the majority of votes at the general meeting and on the Council of Administration in proportion to its shareholding; private persons may participate to the extent of 40 per cent. The company will have the right to impose an annual tax for the use of receiving apparatus, fixed by agreement with the Ministries of Finance and Communications and with the approval of the Council of Ministers. Of this tax the General Post Office will take at least 30 per cent., of which it will give 10 per cent. to the town hall in the place where the apparatus is installed. The Ministries of Education, Worship and Arts, and of Communications will each have a delegate on the Board of Administration and 50 per cent. of the net profits accruing to the State from the company shall form a fund to be used specially for purposes of propaganda and national culture by wireless telephony. The broadcasting company can make agreements with enterprises in the country or abroad for the supply and erection of transmitting and receiving apparatus in models approved by the General Post Office. The General Post Office will register and control all apparatus in order to make sure that no system is used which might disturb other posts. All apparatus imported from abroad and that made in Rumania must, before being sold, bear the seal of control of the General Post Office. For certifying the apparatus the Post Office will charge a tax.

Transatlantic Broadcasting.—EXCHANGE OF PROGRAMMES.—In connection with the development of international broadcasting, the British Broadcasting Co. has sent a message to America through Mr. David Sarnoff, vice-president and general manager of the Radio Corporation, stating that, further to explore the possibility of an international exchange of programmes, the British organisation plans to establish a central station for receiving the world's most powerful broadcasting stations, and it hopes during the next winter season to be able to re-transmit to its 10,000,000 listeners Transatlantic programmes. The complete technical arrangements made on both sides of the Atlantic encouraged the B.B.C. definitely to allocate part of its programme time as an "American Programme Period, and it understands that similar arrangements will be made in the States. The scheme concerns other European countries besides England, and the *Evening News* explains that Continental programmes will be picked up by a new receiving station which is being built just outside London and thence conveyed by land line to Daventry, whence they will be re-radiated.

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Telephotography in America.

Developments in the Transmission of Pictures over Telephone Lines.

THE broad principles of the electrical transmission of drawings, figures, photographs, &c., from one point to another have been known for years, but the systems heretofore devised have been insufficiently developed to meet the requirements of modern commercial service. Prominent amongst the newer developments which have facilitated picture transmission are the photoelectric cell, thermionic amplifier, electrical filters, and the use of carrier currents, the method described below having been designed for practical use over long distances on the Bell telephone network in the U.S.A.

Fig. 1.—Indian Lake, Adirondachs ; 220-mile Circuit.

The successful development that has taken place during recent months may be gauged from the accompanying illustrations, all of which have been reproduced from untouched prints made from the untouched negatives taken from the receiving apparatus in March and April, 1925. Each picture was transmitted in 7½ minutes, those shown in figs. 1 and 2 having been sent from Washington to New York City over a 220-mile telephone circuit, while those shown in figs. 3, 5 and 6 from New York to Chicago, or *vice versa*, over a circuit 931 miles long.

The negative picture to be transmitted is prepared in the form of a transparent positive celluloid film which is bent into the shape of a cylinder; the latter is mounted on a carriage that is made to move along its axis at the same time that the film cylinder is rotated, and a spot of light thrown upon the film by an optical system is thus caused to traverse the entire film area in a long spiral. The light passing into the interior of the cylinder varies in intensity with the transmission (or tone) of the picture, and is transformed into a variable electric current by means of a photoelectric cell upon which it impinges. The vacuum cell has an alkali metal cathode (such as potassium), and its response to variations of illumination is practically instantaneous, the photoelectric current being directly proportional to the intensity of the light spot. Assuming the photoelectric current (which is d.c. of varying intensity) to be adequate and the transmission line to be suitable for carrying d.c., the photoelectric cell current may be imagined to traverse a communication line, at the far end of which is a "light valve" for reproducing the transmitted picture. This valve consists of a narrow ribbon-like conductor lying in a magnetic field in such a position as to entirely cover a small aperture; by passing the incoming current through the ribbon, the latter is deflected by the interaction of the current and the magnetic field, and so exposes the aperture beneath. Light passing through the aperture is thus varied in intensity, and if it is allowed to fall upon an unexposed photographic film (bent into cylindrical form and rotating in exact synchronism with the film at the sending end), the film will be exposed by amounts varying in proportion to the lights and shades of the original picture.

Fig. 3.—Interior View, Library ; 931-mile Circuit.

Fig. 2.—Capitol Buildings, Washington ; 220-mile Circuit.

Of the existing electrical means of communication, the wire telephone circuit has proved to be the most suitable for adaptation to the system postulated. Commercial long-distance telephone lines are, however, not ordinarily suitable for transmitting weak direct or low-frequency currents, and accordingly the photoelectric cell current is amplified by thermionic valves and then impressed upon a modulator jointly with a carrier current whose frequency is about 1,300 cycles per second. What the telephone line transmits, then, is the carrier wave modulated by the photoelectric wave so that the currents are similar in

frequency range and amplitude to the currents corresponding to ordinary speech. When the modulated carrier current traverses the ribbon of the light valve at the receiving end, the aperture is opened and closed with each pulse of alternating current; the envelope of the pulses follows the light and shade of the picture, but

controlled by electrically-operated tuning forks. Impulses controlled by the fork at the sending end are transmitted to the receiving station over the same circuit, the picture on a 1,300-cycle carrier and the synchronising pulses on a 400-cycle carrier, the two carrier frequencies being obtained from two thermionic

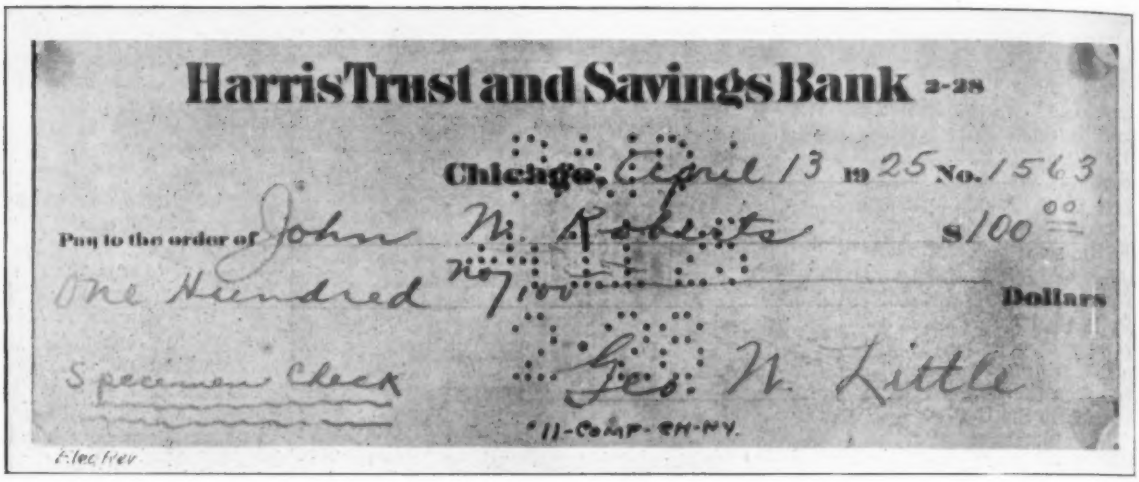
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Fig. 4.—Specimen Cheque Telephotograph.

the actual course of the illumination with time shows a fine structure, of the periodicity of the carrier as indicated by the enlarged section of a picture (fig. 8), the black lines being traces of the image of the light valve aperture. Superposed on the larger variations of width, which are proportional to the light and shade of

valve oscillators, and the two currents are kept separate by electrical filters at the sending and receiving ends of the line. Space considerations do not permit reference to the interesting electrical circuits of the amplifier-modulator and filter systems; the functions of starting the two ends simultaneously and the transmission of

Fig. 5.—Michael Faraday; 931-mile Circuit.

Fig. 6.—X-ray Picture; 931-mile Circuit.

the picture, small steps may be noted (particularly where the line width varies rapidly), which are caused by the carrier pulses.

To secure accurate reproduction, the rotation of the transmitting and receiving cylinders is maintained at the same uniform rate with the aid of phonic wheels

signals are performed by the interruption of the picture current working through detectors and relays, while testing circuits are provided for adjusting the various elements without utilising the actual transmission line. No important changes in the transmission characteristics of the telephone line are called for; with regard to the

frequency range of the a.c. transmitted and also the permissible line attenuation, picture transmission is less exacting than speech, but variations in the transmission loss of the line, or noise appearing even for a brief instant, will be recorded as blemishes on the finished picture, while a high degree of balance between the lines and their balancing networks at repeater points is necessary. Picture transmission by radio is less stable and not so free from interference.

There are two methods of reception: (*a*) When an image of the light valve aperture is formed on the

Fig. 7.—Specimen Finger Print.

photographic surface, the picture is made up of lines of constant density and varying width. A merit of this type of picture (when received in the negative form) is that if the structure is of suitable size (from 60 to 65 lines to the inch) it may be printed directly on zinc for making a typographic printing plate, thus saving copying time, but a disadvantage is that such a picture does not readily lend itself to retouching or to change of size in reproduction. (*b*) If, however, the light from the light valve is allowed to fall on the film in a diffused manner through an aperture of fixed length so that lines of constant width (exactly juxtaposed), but of varying density, are produced, prints made from film negatives received in this way (if the structure is chosen fine enough, *i.e.*, 100 lines to the

Fig. 8.—Portion of Variable-line Picture, Enlarged.

inch, or more) may be reproduced by the ordinary half-tone cross-line screen. Electrically-transmitted pictures are, in general, suitable for all purposes for which direct photographic prints are used, being faithful copies of the originals.

In conclusion, we have to express our indebtedness to Mr. F. Gill (International Western Electric Co.) for furnishing the pictures reproduced herewith, the accompanying details of the system employed having been abstracted from the *Bell System Technical Journal*.

A Record of Half-a-Century.

Messrs. Johnson & Phillips's Charlton Works.

To have remained on the same site, constantly growing in importance and magnitude, for half a century is a record which may be paralleled in mechanical engineering, but is probably unique in the electrical field.

Fig. 1.—Original J. & P. Workshop.

Fig. 2.—Main Cable Shop; 20,000 sq. yd. Area and 1,000 ft. Long.

Messrs. Johnson & Phillips started the manufacture of cables and accessories in 1875, in the primitive workshop illustrated in fig. 1, which is still standing in the midst of the buildings which now occupy over 15 acres and employ approximately 2,500 workpeople. In those days Charlton was a village, and the electrical industry consisted wholly of telegraph engineering; commencing in that line, the firm contrived its own machinery not only for making submarine cables but also for laying them, and has continued the business with such success

that it claims to have equipped the majority of the world's cable steamers with paying-out, picking-up, and cable-handling machinery.

The introduction of electric lighting opened a new field for the company's activities. At that period electrical engineers hesitated at nothing; if they wanted

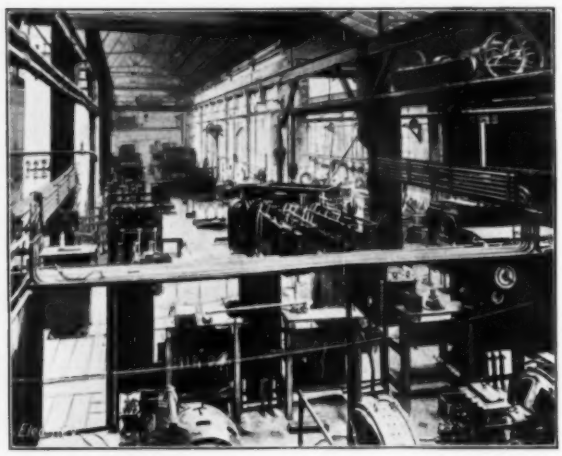

Fig. 3.—Transformer Shop Bay.

some piece of apparatus they made it, and thus a dynamo factory sprang up at Charlton—of which for a time the late Dr. Gisbert Kapp, who exercised so great an influence on dynamo design, was the director—and large numbers of machines were manufactured during the 'eighties and 'nineties. Arc lamps were also produced, the Brockie-Pell lamp which at one time was so widely known and highly esteemed being first manufactured by the company, which maintained its position in the front rank of arc lamp makers until the metal-filament lamp came into general use. The "Metroflam" magazine flame-arc lamp, designed by the late Mr. James Brockie, was one of its products. Rubber-insulated cables, of course, for lighting and power, were manufactured at the Charlton works, and from these it was a natural step to the production of lead-covered, paper-insulated cables for feeders and distributors. Such cables, for ever-increasing power and pressure, to-day form a most important part of the company's output, the cable shops, of which one is illustrated in fig. 2, occupying a large proportion of the floor space of the factory. Here, again, as in the case of submarine cables, Messrs. Johnson & Phillips designed their own machinery, and have supplied similar plant to almost

Fig. 4.—A Section of One Switchgear Shop.

every manufacturing country in the world. They make paper-insulated cables for pressures up to 33,000 volts, as well as the junction boxes, &c., for use with them; they also make cables insulated with vulcanised bitumen for mining work, claiming for their "Elastumen" type that it is free from the decentralising trouble, and like most other cable makers, they have their own "J. & P." twin metal-sheathed surface wiring system, for which all the virtues are claimed, as well as their cab-tire-sheathed wires and cables. Electric light flexibles and trunk telephone cables are likewise included in the company's operations.

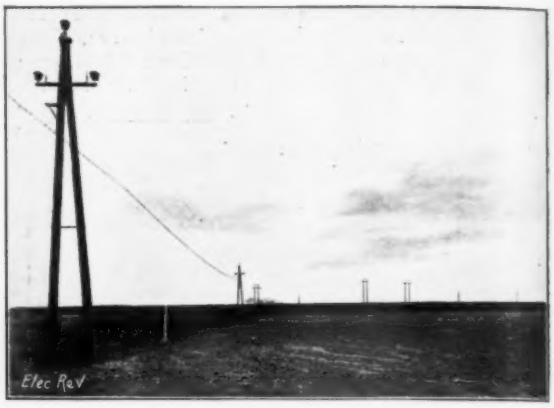

Fig. 5.—A 33,000-V Line; Edinburgh Corporation.

Generators are not now built at Charlton; the company has devoted its attention rather to the transmission end of the electrical circuit, and this involves the addition of the manufacture of transformers and switch-

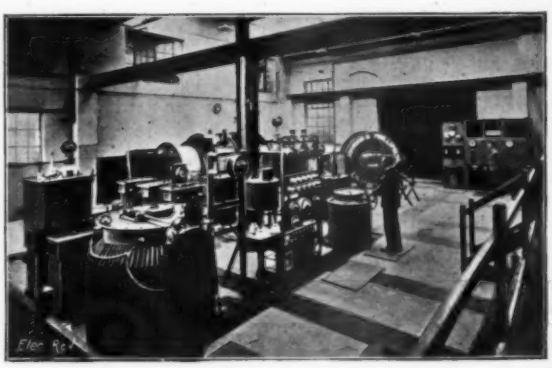

Fig. 6.—One of the Cable Testing Rooms.

gear to that of cables; at the time of a recent visit the transformer shop, of which we give a view in fig. 3, appeared to be working at its maximum capacity, a large proportion of the output being for export. Moreover, as our pages have witnessed, the company adopts an enlightened attitude with regard to the communication of technical infor-

Fig. 7.—Canteen.

mation on the design of transformers to the world in general. Fig. 4 shows a section of the switchgear shop, where are manufactured various types of switchboards for power stations and sub-stations. Ammeters, voltmeters, and frequency meters are included in the company's products.

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Many large home and oversea contracts have been carried out by Messrs. Johnson & Phillips, involving the erection of overhead transmission lines, which naturally fall within the bounds of their chosen field of work. An example of a 33,000-V three-phase overhead line of their construction is shown in fig. 5, and on a later occasion some particulars will be given of the important share that they have borne in the cabling of the Southern Railway which, though not overhead, is generally overground. For use with their aerial lines they have developed pole-mounting transformers and suitable switchgear.

Special attention is given by the company to the development of export trade, particularly within the Empire, with marked success; from 25 to 30 per cent. of the turnover is for export; but the home trade is not neglected. Large contracts with the postal authorities at home and in the British Dominions are being fulfilled, and the contract for cables for the South-Eastern section of the Southern Railway is said to have been the largest of its kind yet placed in connection with railway electrification. Recent orders for transformers and switchgear have been received from a score of countries overseas, and overhead lines have been under construction in many parts of this country. Record figures were reached last year, and there are good prospects that the current year will beat them. It will be seen, therefore, that this concern though old in years is young and vigorous in spirit, and may look forward to the completion of another half-century with the confidence born of conscious integrity and strength.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—SYDNEY.—September 14th. New South Wales Public Works Department. Electrical equipment, machinery, &c., for bascule bridge over Cook's River at General Holmes' Drive.*

September 21st. Material and apparatus for complete communication system, Barrenjack hydro-electric scheme.

MELBOURNE.—Postmaster-General's Department. August 11th. (Sched. C. 26), plugs and sleeves (switchboard). (Sched. C. 25), switchboard cords.

September 15th. Lamps, lamp caps, and lamp sockets. Tender forms from High Commissioner, London.

September 14th. State Electricity Commission. 3,000 kVA transformers and spares.*

Barking.—July 28th. Electricity and Tramways Department. One 1,000-kW and one 500-kW rotary converters, with oil-cooled transformers and synchronising panels or, alternatively, one 1,000-kW and one 500-kW motor-converters (La Cour type), with starting and synchronising panels, e.h.p. switchboard, 3-wire d.c. switchboard and traction board. (July 10th.)

Bristol.—August 10th. Docks Committee. Four 3-ton movable electric jib wharf cranes for the Royal Edward Dock, Avonmouth. Spec. (£3) from Mr. T. A. Peace, chief engineer, Avonmouth Docks.

France.—July 31st. French Ministry of War (Service de Genie) in Paris. 1,500 metres of 25-pair conductor lead-covered cable and 1,000 metres, with 14 pairs of conductors. Particulars from Etablissement Central du Materiel de la Telegraphie Militaire, 51, bis Boulevard de la Tour Maubourg, Paris.

Grimsby.—August 1st. Electricity Department. Storage battery, booster, and switchgear. (July 10th.)

Steel lamp standards. (See this issue.)

India.—August 5th. India Store Department. Electric ceiling and table fans. (See this issue.)

August 11th. 313-kVA 3-phase alternators and exciters and accumulator cells. (See this issue.)

London.—ST. PANCRAS.—September 3rd. Electricity Department. One 10,000-kW steam turbine, alternator, condensing plant, pipes, &c. (July 17th.)

BETHNAL GREEN.—July 20th. Electricity Department. L.p. cables and switchgear. (July 10th.)

ST. MARYLEBONE.—August 31st. Highways Department. One 200-kW turbo-alternator set with surface condenser and auxiliaries; one second-hand 200-kW, 200/220-V d.c. generator set. (July 17th.)

H.M. OFFICE OF WORKS.—July 31st. Incandescent lamps. (July 17th.)

Manchester.—August 7th. Electricity Department. Three-phase, 6,600-V switchgear for Dickinson Street and 6,600-V switchgear for Bowker Vale. (July 17th.)

August 18th. One water-tube boiler, &c. (See this issue.)

Motherwell and Wishaw.—The Corporation is inviting tenders for electric lighting work at 128 houses. Particulars from Director of Housing, Motherwell.

New Zealand.—MARLBOROUGH.—September 22nd. Electric Power Board. Turbines, generators, and switchgear. (B.X. 1,904.)*

Newport (Mon.).—August 15th. Electricity Department. Ferro-concrete foundations for a 10,000-kW turbo-alternator and condensing plant, and one 49/50-ton engine-room crane, &c. (See this issue.)

Nottingham.—August 7th. Electricity Department. One 20,000-kW turbo-alternator, with exciter, condenser, air pumps, oil coolers, air coolers, and auxiliary plant. (July 17th.)

Oban.—August 4th. Town Council. Electric lighting work at six blocks of houses. Specifications from Burgh Surveyor.

Preesall.—August 17th. Urban District Council. E.h.p. 6,600-V cables, l.p. distribution and service cables, including excavation and reinstatement. (See this issue.)

South Africa.—JOHANNESBURG.—August 1st. Municipal Council. Twelve a.c. power relays.*

September 3rd. South African Railways and Harbours. Five 4-wheeled traversers and two tractors.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Bedford.—Electricity Committee. Accepted:—
Three rotary converters (£3,926).—Crompton & Co., Ltd.
Rotary feed pump (£249).—W. H. Allen, Sons & Co., Ltd.

Boston.—Town Council. Accepted:—
Installing electric light at the Assembly Rooms.—J. & S. Farr, Ltd.

Bradford.—Tramways Committee. Accepted:—
100 steel tramway tires (£230).—Hadfields, Ltd.
24 gear wheels and 30 pinions (£183 18s.).—A. Wiseman, Ltd.
500 lap-welded steel poles (£2,750).—Stewarts & Lloyds, Ltd.

Board of Guardians. Recommended:—
Radiological apparatus for St. Luke's Hospital, £977, Newton & Wright, Ltd.; £280, Watson & Sons, Ltd.; and £996, General Radiological Surgical Apparatus Co.

Bromley (Kent).—
Installing electric light at Christ Church, Bromley Park.—G. J. Wade and Son.

Carlisle.—Electricity Committee. Accepted:—
Battery-charging motor-generator set (£226).—English Electric Co., Ltd.
Exciter armature (£97).—British Thomson-Houston Co., Ltd.

Croydon.—Farm Committee. Accepted:—
Substitution of electricity for gas power at Beddington sewage farm (£2,075).—J. & T. Robinson.

Electricity Committee.
Alterations and additions at High Street offices and showrooms (£9,994).—E. H. Smith. (Accepted.)
Two 50,000-lb. Clayton-type boilers, with stokers, &c. (£36,424), buildings and foundations (£19,765).—Babcock & Wilcox (recommended).

Tramways Committee. Accepted:—
Points, crossings, &c. (£2,491).—Hadfields, Ltd.

Government Contracts.—The following Government contracts were placed during June, 1925:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).
Galvanometers.—Elliott Bros. (London), Ltd.
Motor alternators and spares.—E. N. Bray, Ltd.; Crompton & Co., Ltd.; G. Kent, Ltd.; W. Mackie & Co.; Small Electric Motors.
1,500-kW motor converter, &c.—British Thomson-Houston Co., Ltd.
Motor-generator sets.—Metropolitan-Vickers Electrical Co., Ltd.
Starting resistances.—Whipp & Bourne, Ltd.
Switches.—General Electric Co., Ltd.; Hawkers, Ltd.
Change-over switches.—General Electric Co., Ltd.; Whipp & Bourne, Ltd.
Electric tractors.—Electromobile, Ltd.
Wireless apparatus.—Dorman & Smith, Ltd.; Gambrell Bros., Ltd.; Park Royal Engineering Co., Ltd.; Radio Instruments, Ltd.; H. W. Sullivan, Ltd.; Veritys, Ltd.
X-ray apparatus.—A. E. Dean; Newton & Wright, Ltd.

WAR OFFICE.
Batteries.—Pritchett & Gold & E.P.S., Ltd.
Electric cable.—Fuller's United Electric Works, Ltd.
Electric cells.—Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.; Siemens Bros. & Co., Ltd.
Rotary converter.—English Electric Co., Ltd.
Economiser.—E. Green & Son, Ltd.
Electricity meters.—Ferranti, Ltd.; General Electric Co., Ltd.
Electric lamps.—British Thomson-Houston Co., Ltd.; Cryselco, Ltd.; General Electric Co., Ltd.; Stella Lamp Co., Ltd.
Turbo-alternator.—Metropolitan-Vickers Electrical Co., Ltd.
Electric lighting installation, Devonport Military Hospital.—C. H. Robinson & Son.

AIR MINISTRY.
Underground cables, Tangmere.—Watshams, Ltd.

POST OFFICE.
Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; Bonnella Bros., Ltd.; British L. M. Ericsson Mfg. Co., Ltd.; General Electric Co., Ltd.; Siemens Bros. & Co., Ltd.; Sterling Telephone and Electric Co., Ltd.; Western Electric Co., Ltd.
Testing and protective apparatus.—British L. M. Ericsson Mfg. Co., Ltd.; Phœnix Telephone & Electric Works, Ltd.; Power Equipment Co., Ltd.
Cable (various).—Callender's Cable & Construction Co., Ltd.; Connolly's (Blackley), Ltd.; Enfield Cable Works, Ltd.; W. T. Glover & Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Macintosh Cable Co., Ltd.; Siemens Bros. & Co., Ltd.

Compound.—W. H. Keys, Ltd.
Telephone cords.—British Insulated & Helsby Cables, Ltd.; Phœnix Telephone & Electric Works, Ltd.; Western Electric Co., Ltd.
Generators.—Radio, Phonopore & Electricals, Ltd.; Siemens Bros. and Co., Ltd.
Insulator spindles.—Bullers, Ltd.; T. W. Lench, Ltd.
Bronze wire.—T. Bolton & Sons, Ltd.; British Insulated & Helsby Cables, Ltd.; Elliotts Metal Co., Ltd.; R. Johnson & Nephew, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co., Ltd.
Copper wire.—T. Bolton & Sons, Ltd.; British Insulated & Helsby Cables, Ltd.; Elliotts Metal Co., Ltd.; Enfield Cable Works, Ltd.; R. Johnson & Nephew, Ltd.; Johnson, Clapham & Morris, Ltd.; Pirelli-General Cable Works, Ltd.; Shropshire Iron Co., Ltd.; F. Smith and Co., Ltd.; Wilkes, Son & Mapplebeck, Ltd.
Flameproof wire.—Macintosh Cable Co., Ltd.
Manufacture, supply, drawing-in and jointing cable.—Kimberley-Langley Mill (Notts.) and Derby-Belper: W. T. Glover & Co., Ltd. Ipswich-Aldeburgh and Aberdeen-Inverness: Johnson & Phillips, Ltd. Oval-Brixton; Primrose Hill-Paddington; Holborn North and Walworth-Hop Junction: W. T. Henley's Telegraph Works Co., Ltd.
Electric lift, Mount Pleasant new sorting office.—Medway's Safety Lift Co., Ltd.
Private branch exchange equipment.—McNamara & Co. (1921), Ltd. (London, E.C.); Amalgamated Dental Co., Ltd. (London, W.); Scottish Oils, Ltd. (Glasgow); Kenrick & Jefferson, Ltd. (West Bromwich); Union Cold Storage Co., Ltd. (London, E.C.); Chad Valley Co., Ltd. (Harborne); Navy, Army, and Air Force Institute (Kennington).—Relay Automatic Telephone Co., Ltd.
Telephone exchange equipment.—Exeter: General Electric Co., Ltd. Sub-contractors: Tudor Accumulator Co., Ltd., for batteries; Newton Bros. (Derby), Ltd., for machines. Huddersfield and Dewsbury, Topsham and Beaconsfield: General Electric Co., Ltd. Clissold; Clerkenwell; Ealing; Royal, Mountview; North; Addiscombe; Willesden; Streatham; Hop; Brixton; Sydenham; Walthamstow; Langham; and Woolwich: Automatic Telephone Mfg. Co., Ltd. Trafford Park and Aberdeen: Western Electric Co., Ltd.
Telephone repeater equipment.—Dover; Manchester; Taplow; Marlborough: General Electric Co., Ltd.
4-wire repeater equipment and power plant.—Newcastle; Leeds; Derby; Fenny Stratford; Edinburgh: General Electric Co., Ltd. Sub-contractors: Newton Bros. (Derby), Ltd., for machines.

CROWN AGENTS FOR THE COLONIES.

Cables.—British Insulated & Helsby Cables, Ltd.
Carbons.—Kolok Mfg. Co., Ltd.
Electric derrick crane.—Anderson-Grice Co., Ltd.
Electric crane.—Ransome & Rapier, Ltd.; S. Butler & Co., Ltd.
Switchgear.—Metropolitan-Vickers Electrical Export Co., Ltd.
Ceiling fans and regulators.—Crompton & Co., Ltd.
Electric generating plant.—Lancashire Dynamo & Motor Co., Ltd.
Telegraph line materials.—Bullers, Ltd.
Telephone apparatus.—British L. M. Ericsson Mfg. Co., Ltd.
Telephone cable.—Callender's Cable & Construction Co., Ltd.; Siemens Bros. & Co., Ltd.
Bronze and copper wire.—Shropshire Iron Co., Ltd.
Copper wire.—Wilkes, Son & Mapplebeck, Ltd.
Wireless apparatus.—Marconi's Wireless Telegraph Co., Ltd.
X-ray apparatus.—Watson & Sons, Ltd.

Hull.—

Electrical work at 40 new houses in connection with the James Reckitt housing scheme extension.—H. Hyde & Co.

Kettering.—Electricity Committee. Accepted:—
30,000-lb. boiler and stoker (£6,525).—Stirling Boiler Co., Ltd.

London.—L.C.C. EDUCATION COMMITTEE.

Electric lighting installation at Maida Vale High School, Paddington:—

Star Electrical Co. (Recommended.)	**£450**
H. J. Cash & Co., Ltd.	599
Troughton & Young	648
Electrical Installations, Ltd.	764
A. Hawkins & Sons	819
R. Brightwell	965

Electric lighting installation at Holcroft Road school, Hackney:—

Smethurst & Co. (London), Ltd. (Recommended.)	**£326**
Tredegars (1923), Ltd.	437
Commercial Telephone & Electrical Co., Ltd.	438
A. Meckhonik	448
British Electrical Installations Co.	486
Stegman & Co.	495
Heath-Pritchard, Ltd.	546
G. A. Weston	579
Power Contracts, Ltd.	626
Belgravia Electric Co., Ltd.	664
W. E. Heath & Co.	688

HOLBORN.—Board of Guardians.

Electrical installation at Holborn and Finsbury Hospital, Archway Road, Highgate:—

Knowsley Electrical Co., Ltd. (Accepted.)	**£2,530**
Etna Lighting & Heating Co., Ltd.	2,587
T. Clarke & Co., Ltd.	2,801
Belgravia Electrical Co.	2,805
Electrical Installations, Ltd.	2,927
G. N. Haden & Sons, Ltd.	2,985
Smethurst & Co. (London), Ltd.	3,024
Eastern Armature Winding Co.	3,082
Francis Polden & Co., Ltd.	3,195
F. G. Edey & Co., Ltd.	3,312
Domestic & General Electrical Co., Ltd.	3,500
A. F. Goodwin & Co.	3,555
British Electrical Installations Co.	3,618
Ellis & Ward, Ltd.	3,744
Thorn & Hoddle, Ltd.	3,980
Alex. Hawkins & Sons	3,998
Heath-Pritchard, Ltd.	4,106
C. Mickleburgh	4,236

SHOREDITCH.—Lighting Committee. Recommended:—

Coal weighing and conveying plant:—	
H. J. King & Co.	£2,342
Fraser & Chalmers	£3,215
Goodall & Clayton	£3,910
Babcock & Wilcox	£4,598
(Alternative)	£4,568
ditto (Recommended)	**£4,275**
Structural Engineering Co.	£4,841

Coal weighing and conveying plant (£4,275).—Babcock & Wilcox.

HAMMERSMITH.—Electricity Committee. Accepted.
Extensions to condensing water plant (£17,144).—Geo. Wimpey & Co., Ltd.
Circulating pump and motor (£114).—Gwynnes Engineering Co., Ltd.

BATTERSEA.—Electricity Committee. Accepted:—
Three 25-kVA balancers, with kiosks (£120).—Hackbridge Electrical Construction Co.

Lamp Contracts.—The London, Midland and Scottish Railway Co. has placed contracts for six months' supplies of electric lamps with the General Electric Co., Ltd., and the Edison Swan Electric Co., Ltd.

The Aberdeen Line has renewed its contract for Siemens traction lamps with the Siemens & English Electric Lamp Co., Ltd.

Lyme Regis.—Corporation. Accepted:—
Two 75-kW generators for the electric power station (£2,930).—General Electric Co., Ltd.

Weymouth.—Housing Committee. Accepted:—
Electric lighting on the Westham estate (£312).—W. J. Warren & Sons.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—
FAMOS vacuum cleaners.
Pigskin electric lamp shades.

Notes.

Gas v. Electricity.—At the invitation of the directors of the Gas Light & Coke Co. some 300 members of Chambers of Commerce inspected the Beckton works on July 16th. After luncheon, Mr. D. Milne Watson, M.A., LL.D., D.L. (President of the National Gas Council), said he had a shrewd idea that the electricity undertakings were after the gas companies' business; they were not satisfied with power and light, most of which was supplied by them; they wanted the cooking and heating load as well, and that was exactly where the gas companies were up against them. It might be thought they were animated by a spirit of hostility to electricity. That was not true, for they used electricity in their gas works for a number of purposes. The Government, however, seemed to think that it was its special duty at the present moment to boost electricity. This was not a mere whim, but a course that had been advocated by previous Governments. To him it did not seem wise to boost electricity at the expense of gas, or the best way of overcoming the unemployment difficulties of the country, particularly in view of the fact that gas was at present so largely used. If there was any artificial boosting of electricity at the cost of gas, the people's gas would cost them more, though their electricity might cost them less.

New Insulating Material.—A new company named Aktiebolaget Isoleringsmaterial at Noortaelje has started the production of an insulating material called "Sphagni" according to a method invented by the Swedish engineer, M. Bagge. The raw material used is common white moss, which is found in very large quantities on the Swedish peat moors. The moss is dried and then pressed into paper-covered cakes. The cost of production is said to be very low.—*Reuter's Trade Service* (Stockholm).

Fatalities.—An inquest into the death of Leslie R. Bastock an employé at the Staveley Works, near Chesterfield, was held last week. A witness said that he found the deceased lying with his right hand on the switch of an electric motor. He tried to pull him off, but the shock knocked him backwards, and he then ran to the power-house to have the current cut off. A doctor said that artificial respiration was carried on for two hours, but without success. Death was due to paralysis of the respiratory organs. Charles Dissington, electrical engineer, stated that he examined the motor less than an hour after the accident, and found it perfect, but there was a leakage in one of the rods inside the switch. The earth wire had been broken and had evidently been twisted together by an amateur, without being reported to him. The insulation defect in the switch was so small that it was difficult to see. The pressure on the switch was 440 V a.c., and the voltage to earth 240 to 245. A verdict of "Accidental death" was returned.

On July 17th, Andrew Jones, who was engaged in repairing an overhead transmission line at Pentre, South Wales, received a fatal electric shock, while his companion, H. Wallis, sustained a slight shock.

Static Electricity.—At the conference of the Institution of Fire Engineers, held in Edinburgh, a paper was read by Mr. A. M. Cameron, A.I.Fire E., Lasswade, on "Some Notes on the Fire Hazard due to the Development of Static Electricity during the Storage and Use of Inflammable Liquids," a subject that had been given much attention in America, but had been somewhat neglected in this country. A number of delegates having expressed their views on the subject, Mr. Cameron stated that the Institution might gather together all the authenticated cases and have them published.

Czecho-Slovakian Electrical Engineers.—The annual congress of the Union of Czecho-Slovakian Electrical Engineers was lately held at Banska-Bysterica, when among the papers read was one on "The Electrification of the Czecho-Slovakian State Railways," and one on "The Construction of Super Power Stations."

A North Met. Anniversary.—To celebrate the supply of electricity to the British Empire Exhibition (1925), and incidentally its 25th year of activity, the North Metropolitan Electric Power Supply Co. entertained representatives of local authorities, large consumers, purchasers in bulk, and others in its area, to luncheon at the Garden Club, Wembley, on July 15th. The chairman, Sir James Devonshire, K.B.E., occupied the chair, and following the loyal toast he proposed "Electricity and Development," referring to the history of his company and its steady growth since its inauguration in 1900. It had been entrusted by Parliament with an area of 326 square miles in Hertfordshire, Middlesex, and Essex, supplying over 19,000 consumers direct and over 47,000 directly and indirectly. In other words, its development has been from less than 2 million kWh in 1904 to nearly 100 millions in 1924, while Royal Assent had recently been given by an Act of Parliament which extended the company's area by 230 square miles.

All this had been done with a capital expenditure of £2,331,000, of which £973,000 (or 42 per cent.) had been spent on buildings and generator plant; £389,000 (or 17 per cent.) on main transmission lines; £895,000 (or 38 per cent.) on distribution, the remaining £74,000 (or 3 per cent.) representing miscellaneous expenditure.

The company possessed four power stations; the first was opened at Hertford in 1901; in 1904 a supply from Brimsdown was commenced, while in the same year a power station was purchased from the Willesden U.D.C. and the St. Albans station commenced to supply in 1908. The stations were mostly interconnected and their total capacity was 50,000 kW. The company's system was interconnected with those of Luton and Hackney, and a link was now being laid to the new Barking station of the County of London Company, while the above-mentioned Act of Parliament authorised the erection of a new station at Brimsdown.

The districts served by the company numbered 26, with the aid of 182 miles of e.h.p. trunk lines underground and 1,400 miles overhead, in addition to 412 miles of h.p. and l.p. distributing mains underground. Seven authorised distributors purchased the whole of their supplies from the company, and in addition bulk supplies were furnished to the Metropolitan Electric Tramways, Ltd. Wiring installations of all descriptions were undertaken by the company at each local undertaking, showrooms being in existence in nine districts, and two more were to be opened in the near future at Edgware and Harpenden.

The toast was responded to by County Alderman B. Todd, J.P., chairman of the Middlesex County Council, who referred to the benefits that many had received by purchasing energy in bulk from the company. He emphasised the responsibilities of those companies which undertook to supply in bulk, and hoped that they would be able to enjoy a reduction in price in the near future.

Miss C. M. Eve, J.P., Mayor of Stoke Newington, also responded, as also did Sir Herbert Nield, K.C., M.P., vice-chairman of the Lee Conservancy Board, who referred to the efforts which had been made to stampede the country into believing that the Government was to subsidise the electrical industry.

Norway Water Shortage.—The *Financial Times* says that reports from Bergen indicate that the water shortage in Norway has become so acute that numbers of hydro-electric undertakings are apprehensive of a complete stoppage. The majority of companies have already reduced the supply of electrical energy.

The Supply "Change-over" of the Dick-Kerr Works, Preston.—We have received some interesting particulars respecting the supply change-over of the above works of the English Electric Co., Ltd., from its own generating station to the new Ribble power station of the Preston Corporation.

The Dick, Kerr works power station consisted of a 750-kW and one 250-kW reciprocating engines, a 1,500-kW steam turbine-driven generator, and two Babcock & Wilcox and four Lancashire boilers. The conversion to the Corporation supply meant the scrapping of the whole of this plant, together with the existing switchboards, and the installation of a joint sub-station, which is now being effected.

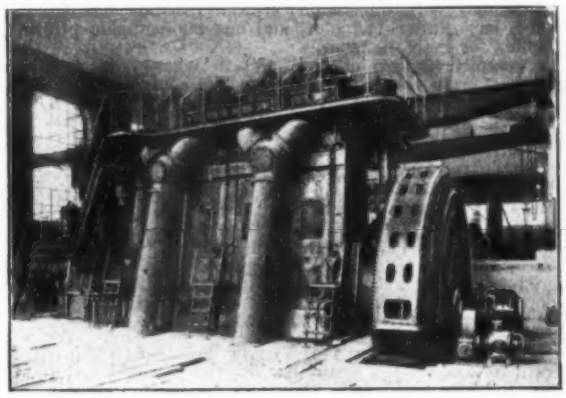
The works were driven throughout by d.c. motors, and it was decided to convert to a.c. all motors where a reasonably steady load was assured in the electrical works and the car works, to scrap the whole d.c. plant and change over completely to a.c. For machine drives, squirrel-cage a.c. motors (three-phase) have been installed, and for lighting, the d.c. wiring has been utilised and balanced between the phases.

Thirty motors, aggregating 600 h.p., in the electrical works, have been changed to a.c.; and in the car works 54 motors, amounting to 585 h.p., are gradually being changed.

The joint sub-station plant to supply the English Electric Co.'s works, as well as the Docks and Marsh Lane areas, consists of two 500-kW rotary converters, with transformers and switchgear on the Corporation side, and one 1,000-kW rotary converter, one 1,000-kW, 6,600 to 420-V transformer, and one 1,400-kW motor-generator for special heavy testing work. The switchboards have been so arranged that one 6,600-V feeder from the Ribble power station supplies the English Electric Co.'s machines, and another the Corporation machines; but the switching of motoring arrangements are such that the Corporation d.c. mains can be fed from the English Electric machines, or *vice-versa*.

The position to-day is that the whole of the power for the works is supplied by the Corporation. The conversion of the building from a generating station to a converting sub-station, and the changing of the motors has been effected without in any way affecting the continuous operation of the factory. Before an engine could be removed it was necessary to arrange for a temporary supply by using one of the machines in the testing department; and in view of the fact that the cellar contained the steam pipes it was necessary to lay the h.p. incoming cables along the floor until such a time as the steam pipes were removed. As soon as this was operating satisfactorily it was possible to remove the vertical engines. The whole of the work in connection with the conversion will be completed before the winter load comes on. In the changing of the shop drives it has in most cases been possible to erect the a.c. motor on a different site from the d.c. motor, so that the change in the drive is only a matter of fitting a belt on the new motor during the meal hour. In those cases where it has not been possible to arrange a new site for the motor it has been necessary to work on Saturday afternoons to carry out this work.

A Large Diesel Stand-by Plant. — To enable it to meet heavy peak loads on its hydro-electric undertaking as well as to act as a stand-by plant in case of emergency, the Berne Municipality has recently installed a 4,000-b.h.p. Diesel-electric plant at its Marzili power station. The undertaking was already provided with steam-turbine stand-by plant, but this will only now be used when the Diesel sets prove insufficient to meet the load. The installation is in two sets each of 2,000-b.h.p., consisting of a two-cycle, 136 r.p.m. Diesel engine, by Messrs. Sulzer Frères, coupled to a flywheel alternator generating three-phase, 50-cycle current. At the outset the sets are required to supply 40-cycle current and the engines are therefore run at 109 r.p.m., developing 1,000-h.p. Tests carried out with the engines running at this speed showed a consumption of 0.418 lb. of fuel per h.p.-hour at full load; 0.423 lb. at three-quarters load; 0.455 lb. at half load; and 0.575 lb. at quarter load. The guarantees were respectively 0.429 lb., 0.440 lb., 0.484 lb., and 0.660 lb. per h.p.-hour. The foregoing figures all relate to fuel of a lower calorific value of 18,000 B.th.u. per lb.



Diesel Stand-by Plant at Berne.

The accompanying illustration shows the first set in position, and, in the foreground, the foundations for the second set. The first was put into commission in November, 1924, while the other commenced running in February last.

Submarine Diesels at Loughborough.—Two Diesel engines taken from German submarines and presented by the Admiralty to the electrical engineering department of Loughborough College, have been adapted for use in connection with the scheme of that college to provide its own electricity supply. One is of 1,850 h.p., and the other 500 h.p. The engines had been made unworkable by the Germans, and the task of re-assembling them has been a formidable one, but, nevertheless, it has been a valuable experience for the students. A very cheap and crude oil is being successfully used for running the engines. The switchgear has been collected from various submarines. When the new power house is completed it will supply the whole of the college buildings, the current being conveyed by overhead wires.

Illuminations on Southend Pier. — This year visitors to Southend will find the illumination of the pier, pierhead, bandstand and dancing pavilion, to be on an altogether more elaborate scale than in the past. It is at the pierhead where the most extensive additions and alterations have been made to last season's illuminations. Festoons of white light in the foreground are supported by posts which are surmounted by G.E.C. fittings and flambeau shades; each shade accommodates a green or flame coloured sprayed lamp. In the dancing pavilion the bandstand is outlined with clear lamps; streamers of clear lamps also radiate from a central four-tier corona of lamps over the dancing floor to the bandstand and the sides of the pavilion. The installation of a number of "Wembley" lanterns illuminating the whole of the dancing floor has proved to be extremely satisfactory.

Electricity on Board Ship.—An interesting event took place at Belfast on the 7th inst. that is, the launch from Messrs. Harland & Wolff's East Yard of the Royal Mail passenger motor liner *Asturias* (22,000 gross tons). The new vessel marks an epoch in the progress of naval architecture, for she is the largest and most powerful motor vessel in the world (with her two Harland-B. and W. 8-cylinder double-acting oil engines. Needless to say, electricity is used largely; there are 400-kW Diesel-driven generators and one 75-kW Diesel-driven emergency generator. There will be some 4,000 lights in all, together with the usual navigation lights with Morse lantern and the high-angle-power lamps and lanterns for working of cargo. A feature of the ship will be the ample ventilation which is so necessary in warm climates, there being over 50 large fans for delivering cold air to the accommodation, in addition to more than 500 cabin and ceiling fans distributed throughout the staterooms and public rooms. The heating throughout will also be electric, there being some 500 heaters in the public rooms and the accommodation. The cooking ranges for passengers and crew will be electric. There will also be two large electrically-heated bakers' ovens, in addition to salamanders, grills, toasters, griddle plates and fish friers. In the dining saloon electrically-heated *rechaud* stands are distributed at intervals in way of the tables.

In the hospitals and barbers' shops large sterilisers will be installed; the barbers' shops will contain electrically-heated hair driers and machines for the application of vibro-massage.

On the decks the electrical equipment includes a 135-h.p. warping winch, two 150-h.p. capstans, and 136-h.p. windlass, together with the motors for the electro-hydraulic steering gear. The watertight doors are electrically operated and controlled from the captain's bridge, where an indicator shows their position at any time.

There are no less than seven electrically-operated lifts and hoists and the following service machinery:—Two mincing machines, one cake whisk, one coffee mill, one bacon slicer, one ice-cream machine, four plate washers, three potato peelers, two dough mixers, one printing machine, one laundry motor, one gymnastic motor, and one photographic printing machine for the dark room.

A complete system of bells and telephones is installed throughout the vessel, and an up-to-date equipment for wireless telegraphy has been fitted both on the ship and the motor lifeboats.

Electricity Supply Rifle League.—The following are the results of the June matches:—*1st Division:* Central A 591, St. James' 573; Central A 589, County 589; City A 578, Central B 561; Shoreditch A 584, Central B 563; Shoreditch A 587, St. James' 557; County 586, City A 577. The Central A team heads the list with nine points. *2nd Division:* Central C 574, City B 573; Central C 569, Shoreditch B 562; City B 573, Epsom 474; Hackney 541, Epsom 444; St. James' A 529, Shoreditch B 515; St. James' A 536, Epsom 412. The Central C team heads the list with 10 points.

Electric Vehicles in the Vienna Postal Service.—At a recent meeting of the Austrian Motor Engineers' Association, Herr Ing. Josef Altmann gave particulars of the electric and petrol vehicles used in connection with the postal service in Vienna. At the present time 26 electric vehicles, built by the Austrian Daimler Motor Co., and 35 petrol vans and trucks constructed by the Austrian Fiat Co., are in service, the "electrics" having a carrying capacity of 1½ tons and the petrol vehicles two tons. The electromobiles are each fitted with compound four-pole motors rated at 6 h.p. at 1,250 r.p.m., driving the rear road wheels through gearing and chains. The controller is adapted to give three speeds, with a maximum of approximately 12 m.p.h. The battery consists of 80 cells, supplied by the Akkumulatorenfabrik Gesellschaft, of Vienna; they have a capacity of 200 amp.-hours and weigh, with their receptacle, about 24 cwt. Owing to the bad hilly roads in the Vienna district, the mileage per charge amounts to only from 25 to 35 miles. For charging the batteries, a special installation was put in for the postal authorities by the A.E.G. Union Electricitäts Gesellschaft. The available 5,000-volt a.c. is stepped down to 380 V by means of six transformers of a total capacity of 400 kW, and converted to the desired battery-charging voltage by 26 mercury-vapour rectifiers. The latter are said to work at 88 per cent. efficiency, their glass bodies having a useful life of from 2,500 to 4,000 hours. Special provision is made for the rapid substitution of charged for discharged batteries; in front of each charging board is a pair of rails on to which the little battery-carrying trolleys can be run in front of a charging board. Along the length of the battery-charging room, at right angles to the other rails, is a set of rails running to the electric vehicle garage on which runs a special trolley capable of carrying two of the battery trolleys. The main trolley, together with an auxiliary one, is run under the vehicle and, by means of special gear, a battery box is quickly released and dropped into position ready for transport to the charging room. At the same time another trolley brings a fully-charged battery.

The records which have been kept indicate that on macadam roads the energy consumption of the vehicle works out at 85 watt-hours, and on asphalt roads at 77 watt-hours per ton-kilometre. In the case of vehicles provided with ball instead of plain bearings, the figures are 77 and 61 watt-hours respectively. Experience has also shown that the positive plates of the batteries have a life of from 4,300 to 4,400 miles, and the negative plates from 8,500 to 8,800 miles. Owing to the greater tare weight and the high cost of electricity in Vienna at the present time, the running costs of the electromobiles are stated to be higher than those of the petrol vehicles. Efforts are, however, being made to reduce the costs not only of electricity, but in other sections of the electrical department, notably in connection with mercury-vapour rectifiers, as a result of which it is anticipatesd the electric vehicles will be able to show results contrasting more favourably with the petrol type.

Island Falls Plant, Canada.—According to the *Electrical News*, Toronto, the plant of the Island Falls, which has been purchased by the Abitibi Pulp & Paper Co. from Hollinger Gold Mines, Ltd., is to be completed to capacity. The order has already been placed for the installation of the two remaining generators. These will be supplied by the Canadian G.E.C. and will have a capacity of 12,000 kVA, operating at 128½ r.p.m. The two machines already installed are 25 cycle, but the two units outstanding will be 60-cycle machines. They are all of the vertical type with direct connected exciters. The wheel pit for No. 3 was completed in the original construction, and the excavation was completed for No. 4. The two final machines will be ready for installation early next year.

Boiler Explosion Report.—We have received a copy of the Board of Trade report of the preliminary inquiry into the explosion at a steam trap at the Great Western Railway power station, Park Royal. The explosion is attributed to the abnormal stresses to which the metal of the cover was subjected when its securing nuts were tightened. Examination of the fractured portions suggested that the cover had been working in an unsafe condition for a considerable period prior to the explosion, and that, when the cover was last rejointed, these fractures were either extended or the remaining metal was subjected to such an abnormal stress that it could not withstand the normal load. Both the existing and final fractures are attributed to the design of the joint. The owners and makers have substituted a design of cover in which the jointing material extends over the whole width of the flange.

Institution Notes.

Institution of Electrical Engineers.—NEW MEMBERS OF COUNCIL.—The following gentlemen have been duly elected members of the I.E.E. Council:—*President*: Mr. R. A. Chattock. *Vice-Presidents*: Lt.-Col. K. Edgcumbe, R.E. (T.A.), and Prof. W. M. Thornton, O.B.E., D.Sc. *Hon. Treasurer*: Mr. P. D. Tuckett. *Members of Council*: Prof. C. L. Fortescue, O.B.E., M.A., Messrs. R. W. Paul, C. Rodgers, S. J. Watson, R. Grierson, Major E. O. Henrici, R.E. (ret.), and Messrs. J. W. T. Walsh, M.A., M.Sc., and E. Leete.

Whitworth Society. — SUMMER MEETING. — The second summer meeting of the Society was held on July 17th. A number of members took tea together at the British Empire Exhibition, Wembley, and in the evening nearly fifty of them dined together at the Holborn Restaurant. The chair was taken by the retiring president, Mr. R. B. Buckley, C.S.I. (senior Whitworth scholar) who installed the new president, Mr. Wm. Sisson (Wh.Sc., 1874). There are now 465 members on the roll.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

The Salaries Committee of Keighley Town Council recommends that as from April 1st, 1925, the salary of the borough electrical engineer (Mr. H. WEBBER) be at a minimum (without bonus) of £800 per annum, plus (1) £20 for every complete 1,000,000 kWh sold above 10,000,000 in each financial year; and (2) as from April 1st, 1926, £30 for every reduction of .03d. in the works costs in each financial year below the figure for the year ending March 31st, 1926.

From Berne we learn that the Swiss Federal Technical High School has lately awarded the title of Doctor to Herr EMIL HUBER-STOCKAR, of Zurich, as a mark of recognition of his work in connection with the development of electric traction and the electrification of the Swiss Federal railways, and to Herr ARTHUR NIZZOLA, president of the Motor Columbus Gesellschaft, of Baden, for his services in connection with Swiss hydro-electric development.

Prof. GUISEPPE PESSION, a captain in the Italian Navy, has lately been appointed General Director of the Post and Telegraph section of the Italian Ministry of Communications.

The degree of Doctor of Science has been conferred by Leeds University upon Mr. H. S. HOULDSWORTH, chairman of the Heckmondwike Council's Electricity Committee.

Since the death of Mr. W. J. Hudson, in May last, Mr. R. W. WEEKES has been carrying on for his widow till his affairs could be settled. Mrs. Hudson has now re-assigned the business to Mr. Weekes as from January 1st last. Mr. Weekes will continue to practise under his own name, and the name "Weekes & Hudson" will not be used any more.

Mr. T. G. HUNTER, formerly representative in South Wales for the Siemens & English Electric Lamp Co., Ltd., has joined Messrs. Johnson & Phillips, Ltd., as their cable sales representative for the southern counties (Hampshire, Sussex and Kent coast). Mr. Hunter will work in conjunction with Messrs. Johnson & Phillips's Portsmouth branch, having his headquarters at Southampton.

Mr. G. RABBITTS, head linesman on Sunderland Corporation tramways for the last 25 years, is leaving to take up an appointment in New Zealand, and has been presented by the Sunderland tramway employés with a wallet of Treasury notes.

Mr. C. BURGESS, manager of the Walsall Tramways since 1920, has secured an important appointment at Shanghai.

At Tuesday's meeting of the L.C.C. the General Purposes Committee brought forward a recommendation that Mr. J. K. BRUCE, the traffic manager, be appointed general manager in succession to Mr. A. L. C. Fell, who retired in December last. The salary proposed is £2,000, the amount which Mr. Fell was receiving. Mr. Bruce's present salary is £1,500 a year, plus a special allowance of £150 per annum while acting as general manager, plus bonus, making £1,856.

It is reported that Mr. H. W. WATTS, of Cheltenham, has been appointed electrical engineer to the Epsom Council.

We are pleased to report that Mr. E. HOLCOMBE HEWLETT, borough electrical engineer, Mansfield, who was taken suddenly ill on the Friday of the I.M.E.A. Convention, has, after a dangerous period during which his life was several times despaired of, now turned the corner and is approaching convalescence.

Mr. GUY BURNEY, retiring managing director of Sterling Telephone & Electric Co., Ltd., paid his farewell visit to Dagenham Works on Thursday last week. In his speech he thanked the employés for their efforts on behalf of the company. One of his chief regrets in severing his connection with the company was the parting with the staff and employés who had worked so well and loyally under him for so many years. Outlining the position of the telephone industry, Mr. Burney said that the domestic trade in which they had specialised for such a number of years was gradually declining, largely due to competition from the G.P.O., who were now giving such splendid facilities to subscribers that privately-owned intercommunication telephones were no longer in large demand. Unhappily the telephone manufacturers had only one customer for public exchange work, the competition for which was keen, with prices very lean. Touching on the future of the radio industry, Mr. Burney expressed the opinion that its future prosperity largely depended upon the attitude of the Board of Trade in regard to the application shortly being made to safeguard the industry against unfair foreign competition. He stated there was ample evidence that radio apparatus was being dumped into this country at prices approximately 50 per cent. below those at which the British manufacturer could afford to market them. German and Austrian telephones were coming in at an alarming rate, prices delivered averaging 6s. per pair. He had an example at 4s., and this was by no means a shoddy production. Foreign loud speakers were now increasing in numbers ranging from 16s. to £3 10s. retail. Components, too, were looming up large, such articles as transformers at 4s., variable condensers from 4s. 6d., &c. When it was realised that the cost of labour in Germany and Austria was between 45 and 50 per cent. below the British rates, it would readily be appreciated that the home manufacturers could not possibly compete. America and France were also doing their share of dumping. Trade unions, Mr. Burney remarked, saw to it that British labour received the union rates of pay, yet they did not appear to concern themselves about the vast influx of foreign goods manufactured in neighbouring countries by labour costing about half of that which we had to pay to British workmen. Such a state of affairs was lamentable, and the sooner the Government realised it the better. British labour must be protected if disaster to industry was to be avoided. At the conclusion of Mr. Burney's speech, he was presented with a silver salver by the employés.

The Shoreditch Borough Council Special Standing Joint Committee recommends that Mr. W. WEEKES, the present chief assistant electrical engineer, be appointed borough electrical engineer on probation for a period of 12 months, as from the date of Mr. C. Newton Russell's retirement, at a salary of £850 per annum.

St. Marylebone Borough Council Electric Supply Committee recommends that special duty pay as follows be granted to the senior technical officers of the Electricity Department for the extra and valuable services rendered by them in connection with the two plant extension schemes adopted by the Council in 1919 and 1923, involving capital outlay of approximately £750,000:—Mr. C. H. SMYTH, chief electrical engineer, £750; Mr. F. B. LEONARD, chief assistant electrical engineer, £550; and Mr. F. SELLEY, mains and sales engineer, £200.

Obituary.—MR. H. BEVIS.—We regret to record the death of Mr. Henry Bevis, M.I.E.E., which occurred on July 16th at East Molesey. Mr. Bevis had been a sufferer for 2½ years. He was managing director of Pirelli, Ltd., and of the Pirelli-General Cable Works, Ltd. The funeral took place on Monday afternoon at East Molesey Cemetery. Mr. Bevis was one of the well-known personalities of the electrical industry in its early days. He was born in 1865, and he joined Mr. (now Sir) Hugo Hirst in 1884 as assistant in the Electrical Apparatus Co., Ltd. When, two years later, Mr. Hirst joined Mr. G. Byng—a step which led to the formation of the General Electric Co., Ltd.—Mr. Bevis continued to manage the Electrical Apparatus Co. for a few years as an opposition concern, but in 1889 the company liquidated and Mr. Bevis then re-joined Mr. Hirst. For 17 years the closest collaboration existed, Mr. Bevis, under Mr. Hirst's leadership, taking a lion's share in the strenuous work attaching to the early development of the G.E.C. Whether it was selling, advertising, catalogue compiling, or manufacturing, Mr. Bevis was always ready to step into the breach, showing great ability and the utmost loyalty. He was one of those who realised the necessity for the Electrical Trades Benevolent Institution, took an active part in its inception and formation, and took the keenest interest in its welfare. He was also a firm believer in the value of electrical exhibitions. Mr. Bevis made a tour round the world in the early history of the G.E.C., and also visited the U.S.A. and the Continent very frequently. He was, in his time, one of the best-informed men on trade in the electrical industry both at home and abroad. About the year 1907, changes of policy of the G.E.C. decided Mr. Bevis to enter a new field of activity and he joined the Pirelli enterprise in this country, which was then closely allied with the G.E.C. For many years he acted as their managing director, playing a most prominent part in making its success. Unfortunately he broke down more than 2½ years ago.

Wills.—The late Mr. THOMAS DUNFORD of the Parsons Marine Steam Turbine Co., Ltd., left £5,611 net and £7,857 gross personalty.

Mr. H. J. COATES, works manager of the G.E.C. branch at Stoke, left £2,622 gross personalty.

New Companies Registered.

Vernita Scott, Ltd. (207,319).—Private company.—Registered July 16th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of, agents for, and dealers in lamp shades and stands, electrical apparatus and accessories, designers, decorators, architectural designers (interior and exterior), builders, contractors, &c. The directors are:—F. A. Basnett, 66, Mercers Road, Tufnell Park, N., building contractor; E. E. Vere de Lissa, 32, Gledstanes Road, Kensington, W.14, stockbroker. Secretary: F. A. Basnett. Solicitors: A. E. Samuels & Co., 36-38, New Broad Street, E.C.2. Registered office: 19, George Street, Manchester Square, W.1.

Curtis Manufacturing Co., Ltd. (207,288).—Private company. Registered July 15th. Capital, £6,000 in £1 shares. Objects: To adopt an agreement with F. C. Curtis and to carry on the business of electrical, mechanical, automobile and general engineers, machinists, sheet and metal workers, pattern makers, and manufacturers of electrical apparatus, &c. The directors are:—F. C. Curtis (permanent governing director), 94, Salusbury Road, Brondesbury, N.W.6; Gertrude Curtis, 94, Salusbury Road, Brondesbury, N.W.6; F. Rice, 47, Crediton Road, Kensal Rise, N.W.10. The governing director, whilst the registered holder of at least 50 per cent. of the share capital, shall be entitled by his will to nominate two directors as governing or ordinary directors so long as such proportion of the share capital forms part of his estate. Qualification, £20 shares. Remuneration as fixed by the company. Secretary: F. Rice. Registered office: 32, Spring Street, Paddington, W.2.

Tomlins, Ltd. (207,213).—Private company. Registered July 11th. Capital, £2,000 in £1 shares. Objects: To carry on the business of electrical engineers and fitters, manufacturers of and dealers in motors, dynamos, and electric, wireless and other appliances, &c., formerly carried on by F. E. Tomlins at 124, High Street, Tunstall, Stoke-on-Trent, as "Tomlins Brothers." The directors are:—F. H. Tomlins, 124, High Street, Tunstall, Stoke-on-Trent, electrical engineer; F. Whitaker, 54, Prestbury Road, Macclesfield, Cheshire, incorporated accountant; H. Boulnois, Hill Crest, Tunstall Road, Biddulph, Staffs., potter's manager. Qualification, 100 ordinary shares. Remuneration as fixed by the company. Secretary: F. Whitaker. Solicitors: Ellis & Ellis, Burslem. Registered office: 124, High Street, Tunstall, Stoke-on-Trent.

G. F. Cooksley & Co., Ltd. (207,289).—Private company. Registered July 15th. Capital, £1,300 in £1 shares. Objects: To acquire the business of an electrical engineer and contractor carried on by G. F. Cooksley as "G. F. Cooksley & Co." at 66, Charles Street, Cardiff. The subscribers (each with one share) are:—G. F. Cooksley, 43, Grosvenor Street, Cardiff, electrical engineer; J. Bromley, 199, Arabella Street, Cardiff, electrical agent. G. F. Cooksley shall be permanent director and chairman subject to holding 100 shares. Qualification of ordinary directors, 100 shares. Remuneration, £300 each per annum (chairman, £350). Secretary: J. Bromley, 199, Arabella Street, Cardiff. Solicitor: H. G. W. Saul, 33, Windsor Place, Cardiff. Registered office: 66, Charles Street, Cardiff.

Radio (Hove), Ltd. (207,257).—Private company. Registered July 14th. Capital, £600 in £1 shares. Objects: To adopt an agreement with T. W. Cutts, and to carry on the business of manufacturers of, agents for, and dealers in wireless broadcasting sets, appliances and parts, motor, electrical and general engineers, &c. The directors are:—E. R. Lees, 30, Gordon Road, Portslade, Sussex; H. W. Lees, Ousedene, Bognor; A. Aisbitt-Gibson, 8, Aymer Road, Hove. Qualification, £50 shares. Remuneration, £10 each per annum. Secretary: H. W. Lees. Solicitor: T. W. Cutts, 50, High Street, Bognor. Registered office: 10, Westbourne Place, Hove.

N. E. C., Ltd. (207,256).—Private company. Registered July 14th. Capital, £1,000 in £1 shares (900 8 per cent. preference and 100 ordinary). Objects: To acquire the business of an electrical contractor as now carried on by J. R. Bessant at Front Street, Wingate, Durham, and to carry on the business of electrical engineers and contractors, omnibus proprietors, automobile and motor engineers, haulage contractors, &c. The permanent directors are:—J. R. Bessant (managing director), 15, Welney Place, Birley Carr, Wadsley Bridge, Sheffield; F. Craft, Lyon House, Front Street, Shotton Colliery, Co. Durham; R. Bessant, 15, Welney Place, Birley Carr, Wadsley Bridge, Sheffield. Qualification, 10 shares. Remuneration, £5 each per annum (managing director, £260). Secretary: Eileen M. Gillatt.

Singapore Traction Co., Ltd. (207,278).—Registered as a public company on July 15th with a nominal capital of £400,000 in £1 shares (200,000 preference, 199,999 ordinary, and 1 management). The preference shares confer the right to a fixed preferential dividend at 7 per cent. per annum (non-cumulative until September 30th, 1925, but afterwards cumulative) and ranking first for return of capital. The ordinary shares take all the remaining profits which it shall be determined to distribute as dividend, and in a winding up take half of any surplus assets after providing for the claims of the preference shareholders. The management share confers no right to any dividend, but in a winding up takes the remaining half of the surplus assets. Objects: To acquire all or part of the undertaking, assets and liabilities of the Singapore Electric Tramways, Ltd., and the undertaking authorised by the Singapore Traction Ordinance, 1925, of the Straits Settlements, to adopt an agreement between Sir William Plender, G.B.E., of the first part, the Singapore Electric Tramways, Ltd., and the said Sir William Plender, as liquidator thereof, of the second part; J. E. Prestwich

of the third part; the Shanghai Electric Construction Co., Ltd., of the fourth part; and this company of the fifth part, to construct, maintain and work by horse, electrical, steam or other power, tramways, railways and other means of communication in Singapore and other parts of the Straits Settlements or elsewhere, and to carry on the business of tramway, railway, omnibus and car proprietors, carriers of passengers and goods, generators, accumulators and distributors of electrical energy for light, heat, motive power or otherwise, &c. The subscribers (each with one share) are:—L. W. Hawkins Basildon House, E.C., chartered accountant; R. S. Portham, 195, Strand, W.C., engineer; A. Bide, Basildon House, Moorgate, E.C., chartered secretary; H. Burfoot, 13, Worbeck Road, Anerley, S.E., registrar; H. Donaldson, 15, Worsley Road, Hampstead, N.W.3, chartered accountant; and two clerks. Minimum cash subscription, 7 shares. The directors are to number not less than three nor more than seven. No qualification required. Remuneration, other than any directors appointed by the subscribers and the managing director, £400 each per annum (chairman, £600). Solicitors: Linklaters and Paines, 2, Bond Court, Walbrook, E.C. Registered office: Basildon House, Moorgate, E.C.2.

Gaskell & Baggaley, Ltd. (207,330).—Private company. Registered July 17th. Capital, £150 in £1 shares. Objects: To act as merchants, manufacturers, and agents in the sale, purchase and manufacture of synthetic crystals and other products of a similar nature, capable of being used in connection with wireless telegraphic installations or telephony, &c. The first directors are:—F. H. Baggaley, 681, Ashton New Road, Clayton, Manchester, chemist; H. R. Gaskell, "The Laurels," Barrington Road, Altrincham, Cheshire, crystal manufacturer. Qualification, 5 shares. Solicitor: W. T. Rylande, 2, Rook Street, Manchester. Registered office: 70, Barton Arcade, Manchester.

Haworth & Williams, Ltd. (207,224).—Private company. Registered July 13th. Capital, £1,000 in £1 shares. Objects: To carry on the business of dealers in wireless receiving and transmitting apparatus and component parts, &c. The directors are:—G. A. Haworth, 13, Yorkshire Street, Accrington; H. G. Williams, 25, Marlborough Street, Accrington. Qualification, 100 shares. Secretary: G. A. Haworth. Solicitor: F. Rowland, 15, St. James's Street, Accrington. Registered office: "Ewbank House," 13, St. James's Street, Accrington.

Official Returns of Electrical Companies.

N.S. Battery and Equipment Co., Ltd.—P. B. Nevill, of 96, Old Broad Street, E.C., was appointed receiver by Order of Court dated June 26th, 1925.

Dowsing Radiant Heat Co., Ltd.—Satisfaction in full (1) on June 1st, 1919, of mortgage or charge dated August 30th, 1912, securing all moneys due or to become due from the company to the London and Provincial Bank, Ltd.; (2) on June 23rd, 1925, of trust deed dated July 29th, 1902, securing £10,000; and (3) on same date of assignment dated July 29th, 1902, executed pursuant to the said trust deed.

X. L. O. Co., Ltd.—Debenture dated July 9th, 1925, to secure £200, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Col. O. C. Sherwood, 10, Chelsea Park Gardens, S.W.3.

Sea Houses and District Electric Supply Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated June 26th, 1925, to secure all moneys due or to become due from the company to the Bank of Liverpool and Martins, Ltd.

Insulated Cap and Rivet Co., Ltd.—F. W. Kellaway, of 112a, Junction Road, Upper Holloway, N.19, was appointed receiver and manager on July 7th, 1925, under powers contained in mortgage dated October 9th, 1923.

Baker & York, Ltd.—D. W. H. Phipps, of 15, Park Row, Nottingham, C.A., ceased to act as receiver for debenture holders on May 19th, 1925.

Berrite, Ltd.—Floating charge on the company's undertaking and property, present and future, including uncalled capital dated July 3rd, 1925, to secure all moneys not exceeding £6,000 for which the mortgagees may become liable by virtue of a guarantee given to the company's bankers. Holders: A. F. Berry, 50, Oxford Street, W., and G. Berry, The Lodge, Cowley, Middlesex.

Robins Wholesale Electrical and Wireless Co., Ltd. (formerly Robins Electrical and Wireless Depôt and Institute, Ltd.).—J. W. Williams, of 5, St. Andrew's Crescent, Cardiff, was appointed receiver and manager on July 10th, 1925, under powers contained in debenture dated April 17th, 1923.

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Edmundsons' Electricity Corporation, Ltd.

The annual meeting was held on July 14th, Mr. P. D. Tuckett presiding. In moving the adoption of the report (*vide* our issue of July 10th, p. 68), the chairman said the profits had increased by £21,223, the net balance showing an increase of £16,424 after writing off last year's ordinary share issue expenses of £2,153 and providing for an additional income tax charge of £2,698. Both the gross trading profit and dividends and interest showed large increases, and it was their knowledge that they were likely to do so which encouraged them last year to restore to the ordinary shareholders the £2 per share previously written off, but although they hoped the profits would continue to expand, he would like them to realise that there was no prospect or possibility of their expanding to anything like the same extent as in the past year. Most of their older subsidiary companies were now paying substantial dividends which they could not expect to see increased much further, while the growing return from the more recent ones must necessarily be comparatively small owing to their investment in them being also comparatively small. They were able to maintain the 7 per cent. dividend on the increased ordinary share capital. The schedule of investments showed a number of changes resulting in an increase of £13,608 in their share holdings and of £5,686 in their advances. Most of their older companies were now paying a reasonable return on their holdings, whilst they and the younger ones continued to make satisfactory progress. Last year, excluding the Lancashire Power Company, their connections increased by over 5,000 kW, of which a large proportion was for lighting, whilst they sold upwards of 1,100,000 kWh more for lighting and about 6¼ million kWh more for power. Coal averaged 3s. a ton higher than in 1923, representing an additional cost of over £10,000, and there was an increase of about £4,000 in their wages bill. Their costs still averaged 100 per cent. or more over the pre-war level. They had, nevertheless, been able to make large reductions in their charges in a number of instances, and wherever the circumstances justified it they looked forward to making still further reductions. Taking the business as a whole he thought they had every reason to feel satisfied with the progress which had been made. He was anxious regarding the Government's avowed intention to assist the electricity supply industry. It had been their unhappy experience to suffer a great deal from legislative interference in the past and they inevitably viewed with misgiving the prospect of having their activities made the subject of the Government's experimental enterprise.

Fuller's United Electric Works, Ltd.

This company's report was briefly reviewed in our last issue (p. 108). The annual meeting was held on July 16th, when Mr. F. R. Wade, O.B.E., who presided, said that continuous hard work and solidification had brought about a steady improvement in the company's affairs. It was satisfactory to note that business had been increased in the face of very adverse conditions. In the last four years the turnover had nearly doubled. It had been necessary to revise the methods of manufacture and during the past year £26,000 had been spent on new plant and the renewal of some of the old plant. This made the expenditure on this account £58,000 for the last two years. There were possibilities of considerable expansion in the future, but although the company was putting itself into a state of efficiency it had to be remembered that if the markets did not exist it could not hope for business. There was a very real danger of a collapse of British trade which no individuals could prevent. The company, however, had considerable fields before it and it must be prepared to finance the work when it was offered. Meetings of the holders of first debentures, income stock, and notes were being called to sanction powers of expansion. The National Bank of Scotland, the company's bankers, had agreed to advance the necessary funds on a prior lien and it was necessary to secure sanction to this. The appointment of Mr. R. P. Wilson C.B.E., to the board was confirmed.

Notices have now been issued calling a meeting of the holders of the 7 per cent. income debenture stock for Monday next to consider a resolution for creating a prior lien debenture in favour of the company's bankers, the National Bank of Scotland, Ltd., for £75,000 to secure a working overdraft up to that amount on terms to include the complete redemption by March, 1931, at the rate of not less than £15,000 per annum; to increase the rate of interest on the first mortgage debenture stock from 6 per cent. to 6½ per cent. and on the income debenture stock from 7 per cent. to 7½ per cent.; and to arrange that no payments between April, 1925, and March, 1928, shall be made in respect of the redemption of the first mortgage debenture stock or of interest on the income debenture stock and notes, the available profits being retained in the business as working capital.

British Broadcasting Co., Ltd.

The annual meeting was held on July 16th, and Lord Gainford (the chairman), in presenting the report and accounts (*vide* our last issue, p. 109), said that the number of licences issued as at June 1st, 1925, was 1,371,581, an increase of 567,000 during the year. He considered that there were still many people evading the payment of the licence fee. The total receipts from the Postmaster-General in the 2¼ years to March 31st, 1925, were £666,000. Of this amount £612,000 had been expended in the provision of programmes. The surplus of £54,000 was sufficient to meet income tax and reserves and leave a small balance. They had a total capital commitment of £179,000. It was essential to provide more alternative programmes for the great majority of listeners; these proposals involved an expenditure of about £100,000. Out of every £100 spent by the company, the programmes and operating costs absorbed £85 7s. 6d.; administration £6 7s. 6d., and depreciation £8 5s. It was proposed to form a staff benefit fund.

Prospectus.—*North Somerset Electric Supply Co., Ltd.*—The list of applications was opened last Saturday and is to close on or before to-morrow, in an issue of 55,000 ordinary shares of £1 each at par in this company. The profits set forth in the prospectus show continuous progress during the past five years. The number of consumers advanced from 872 to 1,171 during 1924, and during the first half of 1925 it has further increased to 1,360, while the revenue for the first half of 1925 has increased by 25 per cent. as compared with the corresponding period of 1924. For the four years 1921-1924 the dividend on the ordinary shares was 6 per cent. per annum. The Electricity Commissioners have made an Order which awaits confirmation

by Parliament under which the company will have powers to supply electricity to rather more than a quarter of the county of Somerset. The purpose of the present issue is the extension of high-pressure mains in a southerly direction.

Anglo-American Telegraph Co., Ltd.—Interim dividends of 15s. per cent. on the ordinary stock and 30s. per cent. on the preferred stock have been declared for the quarter ended June 30th last.

Brazilian Traction, Light and Power Co.—The annual meeting of shareholders of the company was held in Toronto on June 15th. Mr. E. R. Wood, one of the vice-presidents, presided. The chairman said that the results of the year's operation should be regarded as satisfactory considering the unfavourable rates of exchange prevailing. In reply to questions asked by shareholders regarding the continuance of the drought, the chairman stated that there was little prospect of change until the next wet season about the end of the year, but that in the meantime the company was doing everything possible to alleviate the situation, and was proceeding rapidly with large new developments, which it was hoped to have completed within a year. The directors have declared a quarterly dividend of 1 per cent. on the ordinary stock.—*Financial Times.*

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159 :—

American Telephone and Telegraph Co.—$24,219,100 capital stock in shares of $100 each.

Shropshire, Worcestershire, and Staffordshire Electric Power Co.—17,375 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1,110,001 to 1,127,375

The undermentioned securities have been ordered to be officially quoted :—

Adelaide Electric Supply Co.—£350,000 5½ per cent. redeemable consolidated debenture stock.

Adelaide Electric Supply Co.—500,000 6½ per cent. "C" cumulative preference shares of £1 each, fully paid, Nos. 1 to 500,000.

Marconi International Marine Communication Co., Ltd.—The gross revenue for 1924, £976,359, was slightly higher than that of the preceding year, but the net profit, £83,576, was lower. The position is considered satisfactory having regard to the continued depression in the shipping world. It has been necessary to make provision for bad and doubtful debts. The dividend is reduced from 10 per cent. to 7½ per cent. and only £1,745 is carried forward, as against £7,623.

The meeting is to be held to-day (Friday).

Northampton Electric Light and Power Co., Ltd.—A special meeting of shareholders is being called to sanction the appointment to the board of Mr. H. G. Thornton, a director of the Wellingborough Electric Supply Co., and Mr. R. E. Lamb, a director of P. Phipps & Co.; and also to approve an increase in the directors' fees from £1,000 to £1,500 for the current year.

Marconi's Wireless Telegraph Co., Ltd.—A final dividend of 5 per cent. making 10 per cent. for the year 1924, has been declared on the ordinary shares.

County of London Electric Supply Co., Ltd.—The directors have declared interim dividends on the preference shares and one of 5 per cent. on the ordinary shares.

South London Electric Supply Corporation, Ltd.—An interim dividend of 5 per cent. has been declared on the ordinary shares.

General Electric Co. (U.S.A.).—The New York correspondent of the *Financial Times* reports that the company intends to retire $15,137,000 of outstanding 5 per cent. bonds, due September 1st, 1952, at 107½ per cent., with accrued interest.

Yorkshire (West Riding) Electric Tramways Co., Ltd.—An interim dividend of 2½ per cent., actual, has been declared on the ordinary shares.

Electrical Distribution of Yorkshire, Ltd.—A dividend at the rate of 7 per cent. free of tax, has been declared on the ordinary shares for the half-year.

Yorkshire Electric Power Co.—The directors have declared an interim dividend of 3 per cent. on the ordinary shares.

Calgary Power Co.—The surplus for the past year was $[illegible],823 as against $30,791 in 1923.

Stocks and Shares.

MONDAY EVENING.

THE rubber share market again occupies the principal place in the Stock Exchange scene. There has been little diminution in the volume of business, and, although everyone is looking for a setback to occur, if only by reason of the furious pace at which the boom has proceeded, the public interest is maintained at a high rate. It is already beginning to affect other companies through the manner in which the price of raw rubber has risen. Various protests have been lodged against the manner in which, it is maintained, the price of raw rubber has exceeded legitimate bounds. In order to reduce the price, proposals have been put forward, by American buyers and certain British interests, that have for their object the removal of the restrictions at present limiting the output of raw rubber. The Government has declared that the rise in price is regarded by them as being temporary, and that they have no intention of legislating in regard to the restriction scheme. The India Rubber Manufacturers' Association has, however, issued a notice in which the removal of restriction is supported, and in the share market, a few small declines have occurred during the past few business days in the securities of those manufacturing companies which are large buyers of the raw material.

Henleys, for instance, are easier at 2 15/16. Electric Constructions are also 1/16 down at 31s. 3d. English Electrics went back to 18s. 3d. Siemens at 24s. 6d. are 6d. lower, and Metropolitan-Vickers ordinary gave way similarly to 20s. 9d. Shares in several other companies of similar character are slightly easier in tendency, although it is pointed out that the companies will probably pass on, at all events partially, to their customers the addition to costs which the rise in raw rubber entails upon them.

British Aluminiums are better at 30s. Brush strengthened to £1. Fuller's United Electric Works has issued a report in which the company's shareholders are asked to sanction an arrangement whereby the company's bank will advance, on a prior lien, the necessary money for expansion of the work in hand. The price of the ordinary for a long time past has been about 6d. per share, and the 8 per cent. non-cumulative preferences stand about 3s., while the 5 per cent. income-tax free short-term notes changed hands a few days ago at 21½. From which prices it will be observed that there is plenty of room for improvement, from the shareholders' point of view, in the value of their property. The report indicates that there is a reasonable promise of better things in the near future.

Electricity supply shares are quiet. Few changes have occurred in the London list, though Kensingtons at 12¾ have recovered the 7s. 6d. which they lost lately. London Electric preference eased off a little. Bournemouth & Poole are 1/16 higher. Edmundsons went back to 21s. 6d., a fall of 1s. 6d. The new County of London preference are what is called a good market. There is a close price between buying and selling, and the shares have been steadily bought since the market opened, the present price being 1s. premium over the issue price of 20s. 6d., at which the shares came out. No changes have occurred this week in the company's ordinary and senior preferences. Yorkshire Electrics gave way to 30s. There has been a little selling in this market of shares, the money from which was required to finance purchases of popular rubber issues. The third reading of the Summer Time Bill had no effect upon lighting shares generally, but prices have rallied from their recent worst.

The Home Railway market is dull. Dividend announcements are close at hand; the Metropolitan announcement comes on Thursday in this week. Underground Electric ordinary shares of £10 each gave way to 2¾. Districts remain at 45, at which price the yield on the money is nearly 7¾ per cent. Southern Railway stocks are in a little demand, upon the extension of the electrification programme. Fresh weakness in London United Tramways preference has lowered the price to 4s. 6d. London General Omnibus income debenture, which was changing hands last week at 80, has strengthened to 83¼. Yorkshire (West Riding) Trams at 17s. 6d. are 1/16 lower.

Marconi Marine has declared a dividend of 2½ per cent. as the final for the year, making 7½ per cent., against 10 per cent. in the previous twelve months, and 12½ per cent. in the year before that. The price of the shares has dropped to 18s. 9d. and Marconis, in sympathy, went down to 1¾. The Marconi dividend should be out in a few days' time, and, in the light of the Marine Company's cut, it is feared that the parent concern may reduce its distribution to 7½ per cent. Canadian Marconis drooped to 4s. 1¼d. Cable stocks are quiescent. Anglo-American preferred and deferred have lost a little ground.

Brazilian Tractions continue to advance, and show another gain at 59. Anglo-Argentine 5 per cent. debenture shed 1½ points to 71½. Mexican issues are listless and inclined to be heavy. Engineering and allied shares keep moderately firm. Babcocks can be bought at 48s. 9d., the nominally middle price. The rubber market is very hard. City electric lighting Companies must regard with an air of benevolence the boom conditions that keep the lights burning, from sunset to daybreak, in a good many Stock Exchange offices this week.

Thanks are due, and hereby tendered, to a reader who courteously draws attention to a slip which occurred in our tables, in printing the last year's dividend on Siemens ordinary shares. The figure should have been 7½ per cent., instead of 5 per cent. as stated, and this gives a useful opening for a word explanatory of the method adopted here in presenting yields upon the officially-quoted prices. The Stock Exchange Official List sends out double prices, *e.g.*, Eastern Extension Telegraph shares, 16¾ to 17¼. The middle figure is 17, and upon this is calculated, in our tables, the return per cent. to an investor, taking the last year's dividend as the basis. Eastern Extension received 10 per cent. tax-free, upon its £10 shares, a rate which gives a buyer of the shares, at £17 per share, a yield of £5 17s. 8d. free of tax, upon each £100 of money spent on the purchase at this price. It may appear somewhat superfluous, or supererogatory, to enter thus closely into details that are perhaps obvious. In defence, the excuse may be ventured that the City mind is apt to take for granted a familiarity with mechanical matters which are not always clear to the man who stands a little outside the range of ordinary Stock Exchange affairs.

Share List of Electrical Companies.

	Nom. £	Dividend. 1923.	1924.	Price July 20, 1925.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	13	14	24	+ 1/8	5 0 10
Brompton Ordinary	1	10	10	1⅞	—	*5 14 3
Charing Cross Ordinary	1	14½	15	46/9	—	6 8 2
do. do. do. 4½ Pref....	1	4½	14½	17/6	—	5 2 10
Chelsea	1	12	12	1⅝	—	6 8 0
City of London	1	15	15	45/9	—	5 11 2
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	31/-	—	5 3 3
County of London	1	15	15	53/-	—	5 13 3
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	7	21/6	—1/6	6 10 3
do. 7% Pref.	1	6	7	22/-	—	6 7 3
Elec. Supply Corporation ...	1	10	10	33/3	—	6 0 4
Kensington Ordinary	5	14	15	12½	+ ⅜	5 17 8
Lancs. Light and Power	1	7½	7½	25/6	—	5 17 8
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref	5	6	6	5½	+ ⅛	5 9 1
Metropolitan	1	10	11	38/3	—	5 15 0
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	23/3	—	5 4 4
Newcastle-on-Tyne Ordinary ...	1	6	7	22/6	—	6 4 5
do. 5% Pref. ...	1	5	5	18/3	—	5 9 7
do. 7% Pref. ...	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref. ...	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	13⅜	—	6 8 5
South London	1	15	15	2 7/16	—	6 3 1
South Metropolitan Pref. ...	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	17/-	—	4 14 2
do. 6% Pref. ...	1	6	6	20/-	—	6 0 0
Westminster Ordinary	1	15	15	45/6	—	6 6 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	19/6	—	7 13 10
Yorkshire Elec.	1	8	8	30/-	— 1/-	5 6 8
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	68	—	5 17 8
Metropolitan	,,	4	5	63½	—	7 6 0
do. District	,,	3½	3½	45½xd	—	7 13 10
Underground Electric Ordinary	10	Nil	Nil	2⅜	—¼	Nil
do. do. "A" ...	1/-	Nil	Nil	7/-	—	Nil
do. do. Income	Bonds	6	6	98	—	*6 2 5
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	104	— ½	5 15 5
do. Def.	,,	1½	1½	24	— ½	6 5 0
Automatic Telephone	1	3	6	2 3/16	—	2 18 2
Chili Telephone	5	6	5	5 1/16	—	*5 10 4
Cuba Sub. Ord.	10	5	5	6⅞	—	7 8 2
Eastern Extension	10	10	10	17	—	*5 17 8
Eastern Tel. Ord.	Stock	10	10	172½	—	*5 15 11
Globe Tel. and T. Ord.	10	10	10	17½	—	*5 14 3
do. do. Pref.	10	6	6	10⅝	—	5 10 4
Great Northern Tel.	10	22	22	31	—	7 1 11
Indo-European	25	7	8½	41½	—	*4 4 4
Marconi	1	10	—	1⅜	— 1/16	7 5 6
Marconi Marine	1	10	7½	18 9	— 1/16	8 0 0
Oriental Telephone Ord. ...	1	12	12	2½	—	*5 12 11
United R. Plate Tel.	5	8	8	7½	—	*5 12 3
Western Telegraph	10	10	10	16½	—	*6 3 1
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	3½	—	8 16 0
do. do. 2nd Pref. ...	5	6	6	2⅛	—	10 4 4
do. do. 5% Deb. ...	Stock	5	7	71½	— 1½	6 15 2
British Electric Traction Ord. ...	,,	6	6	112	—	5 7 2
do. do. 6% Pref.	,,	6	6	104	—	5 15 5
Brazil Traction	100	4	4	59	+ 1	6 15 7
Brit. Columbia Elec. Ry. Pcs.	Stock	5	5	80½	—	5 11 9
do. do. Preferred	,,	96/-	96/-	83½	—	*5 15 0
do. do. Deferred	,,	129/5	129/8	102½	— 1	*6 6 6
do. do. Deb.	,,	4½	4½	70⅝	+ 1	5 11 1
Lond. & Sub. Trac. 5% Pref. ...	1	2½	—	4 6	- 6d.	Nil
London United Tram. Deb. ...	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds ...	—	5	5	69½	—	8 0 0
Mexican Light Common ...	100	Nil	Nil	25	—	Nil
do. Pref.	100	Nil	Nil	59	—	Nil
do. 1st Bonds ...	—	5	5	6⅛	— 1	7 15 0
Yorkshire (West Riding) ...	1	5	—	17/6	— 1/16	5 14 3
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	12	12	2 7/16	—	*4 18 6
British Aluminium Ord.	1	5	10	1½	+ 1/16	6 13 4
British Elec. Trahsformer Pref.	1	Nil	7	17/6	—	...
British Insulated Ord.	1	15	15	3⅛	—	4 10 8
Brush Ord.	1	10	10	1	+6d.	10 0 0
Callenders	1	15	15	2⅞	—	5 4 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅛	—	... ...
Edison-Swan	4/-	10	10	8/-	—	5 0 0
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	1 7/16	+ 1/16	6 8 0
Enfield Cable, Pref.	1	7½	7½	1⅛	—	6 0 0
English Electric	1	5	5	18/3	—£d.	5 * 7
do. do. Pref.	1	6	6	2 5/16	—£d.	5 17 1
Gen. Elec. Pref.	1	6¼	6¼	2 1/-	—	5 4 0
do. Ord.	1	5	7½	2 1/-	—	6 5 0
Henley	1	14	16	2 1/16	- 1/16	5 8 11
do. 4½% Pref.	0	4½	4½	⅛	—	5 6 0
India-Rubber	1	5	5	1	—	*5 0 0
Johnson & Phillips	1	10	10	9 1/16	—	4 17 0
Met-Vickers, Ord.	1	8	8	20 9	—6d.	7 14 3
do. Pref.	2	8	8	28	—	6 14 9
Siemens Ord.	1	—	7½	24/6	—6d.	2 5
Telegraph Construction	12	20	20	25½	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c		Price July 21.	Fortnight's inc. or dec.
a Acid, Oxalic	per lb.	6¾d.	...
a Ammoniac, Sal	per ton	£60	...
a Ammonia, Muriate (large crystal)	,,	£52	...
a Bisulphide of Carbon	,,	...	...
a Borax	,,	£35	...
a Copper Sulphate	,,	£25 10s.	...
a Potash, Chlorate	per lb.	4d. to 4¼d.	...
a ,, Perchlorate	,,	5½d.	...
a Shellac	per cwt.	£15 15s.	...
a Sulphur, Commercial	,,	£7 15s.	...
a ,, Roll	,,	£7 15s.	...
a Soda, Chlorate	per lb.	3¾d. to 3¾d.	...
a ,, Crystals	per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ...	per lb.	4d.	...
METALS, &c.			
b Aluminium, Ingots	per ton	£120 to £125	...
b ,, Wire	per lb.	1/9 to 2/6*	...
b ,, Sheet	,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—			...
Grade I	per ton net	£231	...
Grade II	,, ,,	£165	...
Grade III	,, ,,	£92	...
c Brass (rolled metal 2" to 13" basis)	per lb.	9¾d.	...
c ,, Tubes (solid drawn) ...	,,	11¾d. to 1/-	...
c ,, Wire, basis	,,	10¼d.	¼d. inc.
c Copper Tubes (solid drawn) ...	,,	1/1	...
c ,, Bars (best selected) ...	per ton	£91	£1 6s. inc.
c ,, Sheet	,,	£91	£1 inc.
c ,, Rod	,,	£91	£1 inc.
d ,, (Electrolytic) Bars ...	,,	£67 5s.	4.s. inc.
d ,, Sheets ...	,,	£148 10s.	...
d ,, Wire Rods ...	,,	£77 5s.	45s. inc
d ,, H.C. Wire	per lb.	9¼d.	¼d. inc.
f Ebonite Rod	,,	2/- to 3/6	...
f Sheet	,,	2/- to 3/6	...
a German Silver Wire	,,	2/8	...
b Gutta-percha, fine	,,	8/3	...
b India-rubber, Para fine	,,	4/1	1s. inc.
l Iron Pig (Cleveland Warrants) ...	per ton.	nom.	...
l ,, Wire, galv. No. 8, P.O. qua	,,	£21	...
g Lead, English Pig	,,	£26 5s.	2 s. inc.
g Mercury	per bot.	£14 to £14 5s.	...
e Monel metal (as sold) small ...	per lb.	3d. to 3/-	...
e ,, ,, medium	,,	4/- to 5/-	...
e ,, ,, large ...	,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings	,,	1/3½	...
p ,, ,, drawn bars & rods	,,	1/3	...
p ,, ,, rolled strip & sheet	,,	1/9½	...
p ,, ,, wire	,,	1/3½	...
o Platinum	per oz.	£26	...
J Silicium Bronze Wire	per lb.	1/0½	...
r Steel, Magnet, in bars	,,	7½d.	...
a Tin, Block (English)	per ton.	£251 10s. to £254 15s.	£6 5s. to £6 10s. inc.
n ,, Wire, Nos. 1 to 16 ...	per lb.	2/11	...

*For 1 cwt. lots. Special quotations against definite specifications

Quotations supplied by

a G. Boor & Co.
c The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
n Edward Till & Co.
l Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Mathey & Co., Ltd.
o C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

The Convention of the Illuminating Engineering Society, U.S.A.—The nineteenth annual convention of the Illuminating Engineering Society, U.S.A., will be held during the week of September 14th-18th at Detroit, Michigan, with headquarters at the Hotel Statler. A programme of papers is being arranged by Mr. Frank C. Taylor, chairman of the Committee on Papers. A complete session will be devoted to motor-vehicle lighting, with papers by a number of well-known authorities, covering such topics as State regulation of head-lights, depressible beam head-lighting and the latest developments in traffic control systems. Another session will be allotted to a symposium on natural lighting, which will be held under the leadership of the Society's Committee on Natural Lighting. There will also be a symposium on residential street lighting. Among the other topics which will be discussed are shop-window lighting, high-intensity industrial lighting, floodlighting, computations, recent developments in neon lamps, and photometry of asymmetric lighting units. An entertainment programme of unusual interest is being prepared by Mr. C. C. Munroe, Secretary of the General Convention Committee.

Platinum Finds in Africa.—According to the *Financial News* it is reported that a platinum gold reef, six miles long, yielding 8.80 dwt., has been found along Ngwenia Range, Swaziland. Prospecting operations in the Olifants River section of the Lydenburg Consolidated Platinum Mines properties disclose satisfactory values, including a chrome ore body carrying high platinum values and a new upper reef of much promise.

The Problems of Trade and Industry.

A Report on Overseas Markets. Manufacturers View Subsidies with Disfavour. Economic Influences.

"A Survey of Overseas Markets."

THIS sub-title is the description of a volume published last week by the Committee on Industry and Trade.* The principal feature of the survey is a series of statistical articles dealing separately with the Dominions, Colonies, and foreign countries, considered primarily as markets for British goods. In the first place figures are given of population and external trade for the period, 1904-1913, and the latest available post-war year. The share of the United Kingdom in this trade is shown in volume and percentage. The public finance of each country is briefly dealt with and economic development (natural resources, transport, national industry, &c.), is treated at some length. Industrial and commercial policy, including tariffs and the fostering of industries, are then touched upon. The competitive situation as regards commodities and countries is discussed at the end of each section. Another section of the work compares pre-war and post-war customs duties and an attempt is made to estimate the overall change in these tariffs to show whether increases (if any) have raised the average *ad valorem* incidence when the increased value of goods is taken into account. The next chapter contains memoranda on foreign commercial policy affecting British trade and includes such matters as commercial treaties, most-favoured-nation practice, import restrictions, the treatment of British shipping (in the light of measures adopted by foreign countries to aid their own shipping industry), &c. The volume includes a number of interesting statistical tables. Among other things these show the external trade of the United Kingdom over a series of years on the basis of 1913 prices; the share of the United Kingdom and other countries in world trade in 1913 and 1923; and the distribution of our external trade.

In an introduction to the report the Committee makes it clear that the volume does not pretend to constitute a report formulating definite recommendations; it is rather an attempt to assemble the facts and to summarise the main features of the extent and prospects of British trade in overseas markets. It is shown that though, in sterling values, our proportion of the world's export trade appears to have risen from 13 per cent. in 1913 to 14 per cent. in 1923, the great reduction which has occurred in the total world trade means a substantial reduction in the volume of our trade. It is of the greatest importance to make a study of each group of markets to estimate the weight of the various factors which are responsible for the decline in our trade. These factors are:—(1) The decline of the purchasing power of the local populations; (2) The growth of local manufacture; and (3) The displacement of British imports by those of other countries. The Committee considers that the first factor still exerts a considerable, though decreasing, effect. The growth of local manufacture is perhaps the most important permanent factor tending either to limit the volume or to modify the character of British export trade, and this factor is discussed at considerable length. The initial effect is to drive international commerce to the finer qualities of manufacture, the home industry dealing with the simpler and coarser classes of goods, and from this point of view we should be in a favourable position on account of our high reputation. Moreover, the local development of manufactures must inevitably create an increasing demand for goods, and this country should be able to secure its share in the satisfying of this demand. The Committee points out that such re-adjustments as will be necessary are bound to make great and increasing demands on the foresight, intelligence and adaptability of those concerned in the export trade. The Committee next discusses the various means by which local manufacture is assisted in various countries. As regards customs tariffs, the Committee states that, while these are without doubt an important obstacle to the flow of international trade, it appears that taking British trade as a whole, the increases in tariffs which have taken place since 1913 have not so far been an important factor in retarding the recovery of our trade.

As regards import prohibitions and restrictions, the Committee emphasises their harmful effect on trade through the uncertainty with which they operate and the delays and difficulties which they cause, and it welcomes the tendency which is making itself felt for the removal of these restrictions. Reference is also made to the obstruction to trade caused by the multiplication of customs and other similar formalities. The Committee is of the opinion that the parties to the international convention for the reduction and simplification of customs formalities should expedite the general ratification of the convention. In connection with special privileges, concessions or subsidies for industry, the Committee points out that the widespread impoverishment and financial weakness following the war have deterred most governments from embarking on large schemes of direct subsidy, but certain arrangements for assisting industry have been initiated in some countries. Among other things the preferential treatment of national shipping is mentioned and is deprecated. Under the heading of "State control or monopoly," the Committee indicates that, except as regards Soviet Russia, British trade does not appear to have been materially affected by an abnormal increase in such monopolies in recent years.

The last section of the introduction deals with foreign competition and shows that while some of our competitors have been strengthened others have weakened. It is thought that the recovery of Central Europe will eventually benefit British trade, but the rehabilitation of German industry, which is a necessary pre-requisite to the payment of reparations is likely to strengthen Germany's competition for some years. After a brief mention of preferences granted by the Dominions to British goods, the introduction concludes with a statement that it is essential that all concerned should strive to accommodate their outlook, their methods, and their organisation to the changed and changing conditions of world trade.

* Stationery Office (700 pp.). 6s. net.

Subsidies for Industries not Desirable.

FOR a considerable time a Committee of the Federation of British Industries has been examining the various proposals which have been advanced for subsidising industry for the relief of unemployment. The Committee has now issued its report stating the conclusion that no subsidy of a general character applicable to a large number of industries is possible. It is inclined to be dubious as to the advantages of partial schemes especially adapted to particular trades, though the opinion is held that if suitable organisations could be devised for full and rapid consideration of the circumstances, the grant of occasional and temporary subsidies might prove of value in providing employment. Some of the difficulties and dangers involved in a policy of subsidies for general application may be stated here:—

Any general scheme of subsidies might result in many cases in subsidising the relatively inefficient firm to the detriment of the more efficient. It might also tend to deprive of subsidy those firms who had made particular efforts to reduce costs and keep their works running, and those firms which, rather than close down and throw more men out of employment, have been recently accepting orders at or below cost of production. These are the very firms which on general grounds it would be most desirable to help.

It is considered that further thought should be devoted to more limited schemes, each specially adapted to the circumstances of a particular trade, or even a section of a trade, and followed, where practicable, by actual experiments. Any schemes should be designed so as to be of a merely temporary character.

With reference to partial schemes specially adapted to particular trades, these can obviously only be worked out in a concrete and detailed form by each trade for itself. The Federation draws attention to two classes which it considers merit careful consideration. One of these includes trades mainly concerned with large specific contracts, such as shipbuilding and important sections of the steel and engineering industries, which under the present abnormal circumstances of international trade are exposed to exceptional competition from foreign firms. "There is substantial ground for the belief that the occasional quotation of exceptionally low prices, which are well below the general cost of production even in their own country, is being adopted as a deliberate policy by certain foreign firms and groups; and some ground for believing that this policy is being supported by direct or indirect assistance from their Governments or from local authorities. The object seems to be partly to obtain a favourable position for the particular industry and country concerned in respect of future orders, partly to embarrass and injure the more efficient of the British firms which may be competing in the hope that they may be seriously crippled when more normal trading conditions return. Apart from more immediate effects, the loss of contracts of this class is often particularly injurious to future trade, since the firm which secures the original contract is frequently placed in a position to secure a valuable series of repetition orders for repairs, replacements, and extensions."

The Federation therefore suggests careful investigation by the Government and the trades chiefly concerned, as to the possibility of arranging a system by which direct Treasury grants might be made available from time to time for the retention in this country of important orders of this class.

If suitable organisation could be devised for full and rapid consideration of all the circumstances, the grant of occasional subsidies in this manner might prove not only of substantial immediate value in providing employment, but of even greater value in preserving the efficiency and future competitive power of the trades concerned.

Report by the F.B.I. Economic Staff.

THE Grand Council of the Federation of British Industries, at its meeting on July 8th, considered an important report from the Economic Staff on some of the factors which have produced the present trade position. It was decided to appoint a strong committee to consider this report, and to consult with other interests with regard to the questions raised.

Pending this investigation and the publication of the full report, the Council has published the following summary in the hope of eliciting comment and criticism which may throw further light on the grave and complex problems involved:—

The present trade position in the country gives every appearance of becoming permanent. British trade, after improving for some years, has been checked, and during the past few months has been actually going back, and is doing so at a time when the general conditions of the world are favourable to improvement. If the conclusions to be drawn from analysis of pre- and post-war conditions are correct, it is obvious that just as the most favourable general conditions of trade will not make a nation prosperous if it is inferior to its competitors in efficiency and economy of production, so, without such favourable conditions, the highest conceivable efficiency cannot bring active trade and full employment.

Briefly summarised, the prosperity of British industry before the war primarily depended—(1) On a continuously expanding foreign trade rendered possible by the continuous investment on a large scale of British capital for the purpose of developing hitherto undeveloped countries. (2) On reasonably stable political conditions, at least in the principal trading countries. (3) On a plentiful supply of money involving a general tendency for prices to rise throughout the world.

In addition to this, however, the presence of these conditions throughout the decade preceding the war exercised a profound influence on the development and balance of British industry, as they constituted a steady stimulus to the development of export trade, as opposed to home trade. In 1914 capital and labour had moved continuously for many years into the great exporting industries, rather than into the industries which worked for the home market, and even in those industries which worked for both markets the tendency had been for a steady development in the relative importance of the export branch to the "home" branch. The war demand still further developed many of the industries, such as iron and steel, shipbuilding, and many branches of engineering, which already relied on a substantial proportion of export demand to obtain full employment, so that the end of the war found us with industries specially adapted for an active foreign trade and only capable of giving full employment when conditions were favourable for such trade. But in the whole post-war period from 1920 onwards, these conditions have not been present; in fact, precisely opposite economic forces have been at work. There have been many factors largely outside our control, such as unstable exchanges, lack of balance in the world's markets, a great increase in the restrictions and obstacles which impede the flow of international trade, and political instability in many countries. These factors may, however, be considered as temporary in the sense that they may be expected to pass away and, indeed, are already doing so with the return of stable conditions.

There have been other influences, however, operating on the whole trend of our trade, which to a considerable extent have been the result of conscious and deliberate control. The following are among the most important of these influences:—(1) The influence of heavy taxation, depleting the fund of savings available for industrial and foreign investment, and diverting such savings as are available to gilt-edged rather than industrial securities. (2) The influence of the greatly increased expenditure on social services housing, unemployment relief, education, pensions, &c., which has directly stimulated home trade, at the same time checking export trade by increasing costs through the increase in local taxation and direct contributions, and reducing the funds available for foreign and industrial investment. (3) The influence of post-war monetary policy, which by increasing the exchange value of the £ sterling has forced up the price of British goods relatively to world prices and thus stimulated home and import trade and checked export trade. (4) A great and progressive reduction in the amount of investment abroad. The steps necessary during the past nine months to prepare for and achieve the final return to a gold standard have greatly intensified the effects summarised under (3) and (4) above, and the necessary restrictions on the supply of money are, temporarily, at least, affecting home trade as well as foreign trade, with the natural consequence of a further rise in unemployment.

We have therefore the following position: Industry organised and developed for a large and active export trade and incapable of giving full employment unless it obtains it; but the economic forces which in pre-war days stimulated such a trade removed, and in their place forces which directly oppose it. The action of these forces serves to explain the reduction as compared with pre-war in our exports, both absolutely, and relatively to our imports; the increase as compared with pre-war in our home consumption of coal; the fact that despite the reduction of our export trade to 75 per cent. of the pre-war amount, there were in 1923 approximately as many persons in employment as before the war; the alteration in the relative position of sheltered and unsheltered industries; the relative prosperity, both of retail traders and of industries serving the home market only, as compared with industries mainly dependent on export; and the incidence of unemployment as between different trades and occupations. The problem to be solved is whether it is possible to reverse these tendencies and to restore the conditions which as far as all previous experience can guide us are the only conditions in which British industry, as at present organised, can prosper, or whether we must accept post-war conditions as permanent and attempt to re-organise and re-adapt industry to meet the new position. Will political and general considerations permit the Government to make a reduction, not of a few millions, but of 15 to 20 per cent. in national expenditure and taxation? Can local authorities reduce the rates by the same percentage? Is it possible without imperilling the stability of our newly regained gold standard (*a*) to provide more money for trade, (*b*) to allow foreign investment to be resumed? Is it possible, pending the resumption of foreign investment on a scale comparable with pre-war, which must obviously be a question of time, to employ such funds as are available for lending abroad primarily in the direction which will create the most immediate and effective demand for British goods? If these questions cannot be answered in the affirmative, it is obvious that the balance as between export and import trade has been permanently altered, and, while we may reasonably hope for a substantial export trade, sufficient probably to pay for essential imports, we cannot expect it to give us active trade and full employment as in the immediate pre-war period. If this is the case, ought we to wait, as we are doing at present, until the forces which post-war conditions and our own post-war policy have set in motion have brought about a re-adjustment of industry through the sheer pressure of economic necessity, with all that this implies of unemployment and suffering, or should steps be taken to stimulate home development? Can the export trades be helped to divert a portion of their output to new home markets and to adapt some proportion of their productive capacity to new purposes? Can means be devised to assist them to pass with the minimum of dislocation through the difficult transition period?

These are some of the questions which must be answered, and it is obvious that a purely industrial organisation, such as the Federation, cannot solve them by itself.

The Commercial Outlook for Radio.*

THE world wants the radio and it will have it, just as it adopted the talking machine and the automobile. The industry is too new yet to be classed among the stable commercial operations of the period, but it is estimated that not less than 450 million dollars of total sales will be made in the United States this year, an increase of 100 million dollars or more, contrasted with 1924. This of course refers to domestic business. Exports of radio instruments and accessories are already looming large. In 1924 radio exports exceeded six million dollars in value, with a total of nearly three million dollars for the first four months of 1925. At this rate radio exports will double in 1925. Practically no limit can be set on the expansion of radio exports. Regarded in the beginning as a mere toy, or a dispensable luxury or amusement, the radio is destined to live and grow into a stable business. Its comparative cheapness is in its favour. Over and above this the new world that it opens is a stronger argument.

As in the case of nearly all other new and like inventions, the speculative possibilities of the business have been seized upon with unhappy results to many credulous people. Companies without number have been formed and exploited, with attendant losses to those who invested in them. Recent calculations showed a decline in the value of listed or unlisted American radio shares of not less than fifty million dollars. Sooner or later the business will settle down to a plain commercial basis, with one or two large companies leading the field. Organisations ill financed and poorly managed will pass out of existence.

Perhaps it is too much to hope for a standardised radio output within the next few years. The time is coming, nevertheless, when this will happen. As to any estimate of a "saturation" limit it is idle to make predictions. A compilation prepared recently by the Standard Statistics Service shows that while there are more than fifteen million passenger automobiles and nine million talking machines in use in the United States at present, there are only about 3,500,000 valve radio sets in operation. The Service mentioned an authority in the industry as predicting that there will be ten million sets in operation in 1930. This does not seem to be an unreasonable calculation. If the United States alone touches that record the export trade will grow in proportion. It must not be assumed, however, that the United States will have any monopoly in furnishing the world with radio instruments or accessories. Foreign competition will be keen.

Whether America will produce a Henry Ford in the radio industry is doubtful. Whether Europe will develop one is even more doubtful. Competition will be fought out on the plain level of manufacturing costs without much in the way of patent monopoly to give advantage to any single producer.

* From the *Journal* (June) of the British Empire Chamber of Commerce in the U.S.A.

Exports and Imports of Electrical Goods and Machinery in June, 1925.

THE Board of Trade returns for the past month show that our exports of electrical machinery and apparatus reached only 75 per cent. of the April value. The reason for this can again be traced to the item "Submarine telegraph and telephone cable," which is subject to extremely violent fluctuations. In April it made an upward jump of £280,000, and in May it went up a further £83,000; last month the figure experienced a sudden fall to about £16,000. Unfortunately this item is not wholly culpable for the fall of £423,000 in the total, as compared with that of the preceding month Unenumerated electrical machinery exports also showed a considerable decline (£62,000), as did also the other items under the heading "Electrical machinery," amounting in all to £112,000. Another large decrease is shown under the heading "Telegraph and telephone wires and cables (not submarine)." The falls are partly offset by a number of increases, none of which, however, with the exception of "Insulated wires and cables," is of large proportions.

The position for the first half of the year is a substantial improvement over the first six months of 1924, as will be seen from the following summary of exports:—

Exports.	1924.	1925.
Electrical goods and apparatus ...	£4,759,956	£6,142,309
Electrical machinery	2,495 636	3,031,059
Totals for six months ...	£7,255,592	£9,173,368

The increase, as is shown in the table, is £1,917,776.

As regards imports, these remained approximately at the May level, the decrease being of the order of 1 per cent. A very large increase in the value of imported insulated wires and cables was counterbalanced by falls in respect of unenumerated electrical machinery, meters and instruments, telegraph and telephone instruments, and unenumerated electrical goods and apparatus. The June total was considerably higher than the figure for the equivalent month of last year, and the six-months' total shows a rise of £667,000, as appears from the following figures:—

Imports	1924.	1925.
Electrical goods and apparatus ...	£1,373,879	£2,032,105
Electrical machinery	532,695	541,437
Totals for six months ...	£1,906,574	£2,573,542

The value of goods re-exported during June was about half that of the previous month's re-exports, due mainly to the large decreases in the cases of unenumerated electrical goods and apparatus, and meters and instruments. The total for the six months is, however, greater than that for the first half of 1924.

Leaving the values of goods, it is of interest to note that during the first six months of this year the number of incandescent electric lamps exported was 3,109,620, as against 2,385,534 in the first half of 1924. The total weight of electrical machinery exports for the same period was 17,271 tons, as compared with 15,210 tons.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for June, 1925.	Inc. or dec. as compared with May, 1925.	Inc. or dec. as compared with June, 1924.	Electrical imports for June, 1925.	Inc. or dec. as compared with May, 1925.	Inc. or dec. as compared with June, 1924.	Electrical re-exports for June, 1925.	Inc. or dec. as compared with May, 1925.	Inc. or dec. as compared with June, 1924.
Electrical goods and apparatus (unenumerated)	£142,785	+ £8,738	+ £10,274	£79,347	— £9,000	+ £10,932	£4,073	— £12,346	— £1,850
Insulated wires and cables ...	237,366	+ 42,271	+ 49,723	65,821	+ 30,801	+ 31,401	2,969	— 397	+ 2,963
Glow lamps	25,452	— 7,094	+ 1,480	49,392	+ 7,176	+ 37,849	452	+ 188	+ 177
Arc lamps and parts	302	— 257	— 536	812	+ 54	— 767	28	—	— 553
Batteries and accumulators ...	107,840	+ 11,640	+ 57,392	22,688	+ 1,702	+ 6,890	1,583	+ 14	+ 1,140
Meters and instruments ...	29,626	+ 1,443	— 1,385	10,879	— 6,551	— 5,951	212	— 975	— 1,463
Carbons	1,941	+ 1,019	+ 126	6,527	— 2,351	— 739	184	+ 129	+ 110
Electrical Machinery—									
Electrical machinery (unenumerated)	264,888	— 61,840	+ 111,129	80,273	— 19,022	— 15,353	4,820	— 789	— 3,422
Railway and tramway motors	17,867	— 19,528	— 46,125	—	—	—	—	—	—
Other motors and generators ...	157,196	— 25,419	+ 8,670	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	6,977	— 5,451	+ 1,091	61	— 9	+ 49	—	— 95	— 111
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	55,946	— 13,690	— 22,397	15,910	+ 1,557	+ 9,370	467	+ 234	+ 100
Submarine telegraph and telephone cable	15,922	— 357,675	+ 15,922	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	221,065	+ 2,645	+ 74,270	39,297	— 7,842	— 5,377	4,700	— 732	+ 912
Totals	£1,285,173	— £423,198	+ £259,634	£371,007	— £3,485	+ £68,304	£19,488	— £14,769	— £1,997
Increases for the six months ended June, 1925		Exports. + £1,917,786			Imports. + £666,968			Re-exports. + £35,489	

French Electrical Trade.

Imports and Exports by Countries.

THE French Government has now published a detailed statement of the foreign trade of France, by countries, for 1923. From this the following figures relating to imports and exports of electrical and allied material have been extracted. Comparative figures for 1922 are given and a note is added of increases or decreases.

Exports.

	Metric quintals. 1922.	1923.	Inc. or dec.
Dynamo-electric machinery—			
Total	23,030	28,330	+ 5,280
To Belgium	4,910	7,240	+ 2,330
,, Switzerland	300	850	+ 550
,, Spain	3,460	4,270	+ 810
,, Argentina	2,380	1,340	— 1,040
,, Algeria	1,600	2,570	+ 970
,, Tunis	900	1,450	+ 550
,, Morocco	480	2,420	+ 1,940
,, Indo-China	1,100	1,250	+ 150

	Metric quintals. 1922.	1923.	Inc. or dec.
Electrical and electro-technical apparatus—			
Total	21,110	27,110	+ 6,000
To Great Britain	1,300	1,800	+ 500
,, Belgium	7,000	7,500	+ 500
,, Switzerland	255	1,160	+ 905
,, Spain	2,055	2,720	+ 665
,, Algeria	2,000	2,500	+ 500
,, Morocco	885	1,160	+ 275
,, Indo-China	660	860	+ 200
Dynamo and motor frames—			
Total	140	195	+ 55
To Great Britain	3	58	+ 55
,, Spain	—	96	+ 96
,, Belgium	95	32	— 63

	Metric quintals. 1922.	1923.	Inc. or dec.
Insulated wires and cables—			
Total	33,600	26,510	− 7,090
To Belgium	10,800	5,600	− 5,200
„ Egypt	740	1,240	+ 500
„ Algeria	4,300	5,400	+ 1,100
„ Tunis	360	940	+ 580
„ Sarre	10,040	8,500	− 1,540
Armatures and parts for electrical apparatus—			
Total	3,930	6,230	+ 2,300
To Belgium	370	760	+ 390
„ Italy	180	440	+ 260
„ Spain	280	580	+ 300
„ Algeria	430	900	+ 470
„ Morocco	450	1,300	+ 850
Incandescent electric lamps—			
Total	1,290	1,790	+ 500
To Great Britain	100	150	+ 50
„ Belgium	110	230	+ 120
„ Algeria	300	180	− 120
„ Indo-China	335	300	− 35
Imports.			
Steam engines, stationary—			
Total	13,900	10,365	− 3,535
From Great Britain	2,860	1,200	− 1,660
„ Belgium	3,460	2,630	− 830
„ Switzerland	4,730	5,660	+ 930
Dynamo-electric machinery, 1,000 kg. and over—			
Total	35,000	30,200	− 4,800
From Germany	14,000	1,000	−13,000
„ Switzerland	8,000	5,200	− 2,800
„ United States	9,000	16,000	+ 7,000
Dynamo-electric machinery, 50-1,000 kg.—			
Total	7,200	6,700	− 500
From Switzerland	2,000	2,500	+ 500
„ Belgium	700	800	+ 100
„ United States	640	650	+ 10

	Metric quintals. 1922.	1923.	Inc. or dec.
Dynamo-electric machinery, less than 50 kg.—			
Total	4,000	4,150	+ 150
From United States	2,500	2,250	− 250
„ Italy	530	760	+ 230
Electrical and electro-technical apparatus, with insulated windings—			
Total	7,000	10,000	+ 3,000
From Great Britain	1,200	1,400	+ 200
„ Germany	1,800	1,000	− 800
„ Switzerland	1,800	1,900	+ 100
„ United States	1,600	4,500	+ 2,900
Ditto, without insulated windings—			
Total	5,700	5,300	− 400
From Great Britain	1,000	1,300	+ 300
„ Switzerland	1,000	1,300	+ 300
„ United States	1,700	1,350	− 350
Dynamo and motor frames—			
Total	140	1,530	+ 1,390
From Great Britain	—	880	+ 880
„ Belgium	—	630	+ 630
Insulated wires and cables—			
Total	1,150	3,900	+ 2,750
From Great Britain	140	1,600	+ 1,460
„ Switzerland	120	1,250	+ 1,130
„ United States	—	500	+ 500
Armatures and parts for electrical apparatus—			
Total	4,250	8,080	+ 3,830
From Great Britain	600	2,650	+ 2,050
„ Switzerland	1,050	1,180	+ 130
„ United States	600	1,270	+ 670
Metal-filament lamps, mounted—			
Total	3,130	3,580	+ 450
From Holland	2,700	3,150	+ 450
Ditto, unmounted—			
Total	37	48	+ 11

The South-East Lancashire Electricity Board.

Annual Report of the Engineering Advisory and Finance Committees.

AT a special joint meeting of the above-named Committees (Alderman W. T. Dagnall in the chair), held recently, the report of the Board's proceedings during the year ended March 31st, 1925, was approved for submission to the Electricity Commissioners. The Board met first on April 1st, 1924. During the year it approved of the following bulk supply contracts: Manchester-Salford, Manchester-Middleton, and Lancashire E.P. Co.-Horwich, the last-named being the purchaser in each case; originally the Board decided that the supply to the Horwich U.D.C. should be furnished by the Bolton Corporation, but the largest consumer in the Horwich area (*i.e.*, the L.M. & S. Railway) elected to take its supply from the L.E.P. Co. (which has power to continue furnishing detail power supplies notwithstanding the granting of a special order to the Horwich U.D.C.), and the Board therefore approved of the change of the source of the bulk supply, the Bolton Corporation fully concurring.

The following plant and mains extensions received approval: Bury Corporation, one 1,000-kW rotary converter and switchgear; Buxton Corporation, one 400-b.h.p. heavy-oil engine and 255-kW dynamo; Lancashire E.P. Co. (Radcliffe station), two 6,000-kW turbines and four 30,000-lb. B. & W. boilers; Stockport Corporation, two 10,000-kW turbo-alternators (to be installed in two sections); and Manchester Corporation, six 33,000-V cables (two of them to be laid only if financial assistance is granted by the Government).

The Oldham Corporation submitted proposals for the erection of a new station at Chadderton, being a station scheduled to the technical scheme. The first instalment would consist of three 12,500-kW, 6,600-volt, three-phase, 50-period turbo-alternators, with electrically-driven auxiliaries. The Board recommended the Commissioners to sanction the erection of the station; it supported the applications of six constituent authorities for special orders and recommended the Commissioners to grant several in circumstances which clearly went beyond the true intention of the fringe order procedure as originally contemplated, *i.e.*, to deal with premises of specific owners. The fringe order procedure is usefully employed in developing areas which do not warrant the taking out of special orders and the Board considers that geographical area rather than ownership of premises ought to be the basis upon which fringe orders are granted so as to encourage cheap and expeditious development pending the time becoming ripe for the taking out of special orders.

There is no obligation upon a constituent authority to acquaint the Board with its intentions in relation to Parliamentary Bills. The Board, therefore, adopted a resolution requesting all constituent authorities to submit details of any Parliamentary proposals to it in the first instance, and at the request of the Board the Commissioners have indicated their willingness to consult it on such matters.

Regarding interruptions of supply, upon the representation of a constituent authority the Board has given serious consideration to troubles which have arisen through the operations of Post Office contractors. A scheme for giving notice which would secure to a great extent that interruptions should not take place in the future has been drafted and the Commissioners have been asked to endeavour to bring the scheme into being.

The Leigh Corporation has entered into a temporary agreement to take a bulk supply from the L.E.P. Co. for six months from January 1st, 1925, pending the final determination of the permanent source of supply by the Board; the matter is *sub judice*.

The Commissioners referred to the Board a proposal by a company to erect a private generating station at Chinley, about 3¼ miles from Buxton generating station and 5¾ miles from Hazel Grove and Bramhall (an electrically developed area). The character of the intervening areas is such that there is no possibility of the Board's indicating an alternative supply, and it therefore informed the Commissioners that it had no observation to make thereon. The Board is under obligation to submit proposals before May 28th, 1925 (or such extended time as may be sanctioned by the Commissioners) for the supply of electricity in areas in which there is a reasonable prospect of the supply being remunerative. Activities in this connection have already resulted in applications for several special orders, and several others are under consideration.

The coal consumption in the district has improved as follows:—

Year 1919-20	3.112 lb. per kWh generated.	
Year 1923-24	2.190 lb.	„ „
A quarter in 1924 ...	2.05 lb.	„ „

The cost of administration for the year ended March 31st, 1925, amounted to £1,991, which when distributed over the kWh sold during the year ended December 31st, 1923, *i.e.*, 551,251,843, yields a figure of 0.00086d. per kWh, as compared with 0.00119d.* for last year. The district contains a population of 2,833,782, the areas which are at present the subject of distribution orders include a population of 2,670,158, being 94.2 per cent. of the whole. The energy sold amounted during the past year to 632,369,490 kWh, being equal to 223 kWh per head of population, as compared with 100 kWh per head for Great Britain.

* A 12 months' figure calculated from the ascertained 10 months' figure of 0.00099d.

Factories and Workshops.

H.M. Chief Inspector's Annual Report.

THE annual report of the (Home Office) Chief Inspector of Factories and Workshops for the year 1924* shows that the number of registered factories in Great Britain has again increased; the total now stands at 142,494, as against 139,920 for 1923, but the number of workshops continues to decline, and is now 133,720, as opposed to 140 850 last year. Factories thus for the first time exceed workshops in number and, as has been pointed out before, the decline is largely due to the introduction of electrical power, the use of which converts premises from a workshop into a factory. There is, too, the tendency for the small places to be absorbed by the larger ones.

Accidents.

During the year under review 169,723 accidents were reported, an increase of 44,172 over the previous year. The main reason for the increase is stated to be trade improvement in those industries which experience has shown are the chief accident producers. No fewer than 956 fatal accidents were reported last year, an increase of 89 on the total for 1923, the increase having again taken place in particular groups of industry in which fatal accidents are always most numerous, and deaths due to transmission machinery reach the formidable total of 58, an advance of 9 on the figures for 1923; an unusually large percentage of this particular type of accident is of the most serious character, and we know from experience that of all transmission machinery the unprotected rotating shaft claims the most victims. About 85 per cent. of the prime mover accidents were caused by back-fires in internal combustion engines, and the majority of accidents due to starting engines could have been prevented by the use of compressed-air or electrical starting devices. Cranes have been responsible for a total of 3,093 accidents, no fewer than 76 of them being fatalities. The crane as an accident producer is apt to be under-estimated, but as a matter of fact, after falls of persons from heights, and of articles on persons, the crane comes next as a source of fatal accidents and stands far in front of any single type of machine known at present to industry; however, cranes are in use in an immense variety of industries, and predominate where heavy material has to be handled.

Four explosions in dry-cleaning works were notified; one was doubtless, and the others probably, due to the ignition of benzine vapour by sparks caused by electrostatic charges. Under the heading of "Dangerous Trades," the special danger which arises in such operations as the covering of heels for shoes, or the making up of some kinds of advertising goods, by the use of celluloid that is softened in a tray of spirit before application, is pointed out. A fire occurred in one factory, probably owing to one of the workers attempting to remove an electric lamp bulb with a rag (soaked with acetone or other spirit) which caught fire; fortunately it was quickly put out, but the incident emphasises the need for double glass gas-tight electrical fittings where such processes are carried on.

Accumulator Trade.

New Regulations for the Manufacture of Electric Accumulators were issued on March 1st, 1925; the new code, like the old one, deals with the risk of lead poisoning. The old code was confined to manufacture, but, as a like risk is associated with certain processes in the repair of accumulators, the new regulations cover repair work. A recent development in manufacturing processes is the use of a new kind of paste material which avoids the employment of oxide of lead. It is said to be very satisfactory, and its use appears to be extending, but risk of lead poisoning is not eliminated by its introduction. Future experience alone will show to what extent the use of this material will prove less dangerous than oxide. As a result of the wider definition of "lead process," the new rules go beyond the corresponding regulations of the old code; moreover, they set up higher standards.

During the past year many improvements were introduced by manufacturers either to secure compliance with the old regulations or in anticipation of the requirements of the new code. A number of departments were remodelled, and new exhaust plant installed. The rush of orders in many cases has, however, militated against anything in the way of finality being achieved, especially in those cases where the capacity of the works is being fully tested by the present volume of production. It may well be that the present incidence of lead poisoning in the trade is largely the outcome of these circumstances. During 1924 cases of lead poisoning in the accumulator trade totalled 101 (no fatalities), as against 95 (2 fatalities) in 1923. This industry, owing to the increasing use of electric accumulators for motor-cars and wireless sets, is a notable exception to the prevalent trade depression, and has been characterised by a corresponding increase in the number of cases of lead poisoning; 60.4 per cent. of the cases were slight, with absence of symptoms of paralysis, but this is only to be expected with the short time of exposure of the workers to the baleful influence of lead dust. Undermining of the health must be slowly taking place and, as poisoning is due to dust, it is clearly amenable to exhaust ventilation meticulously applied as near as possible to the point where the dust is generated. Regulations based on this principle were drawn up by Dr. Bridge and Mr. Price, in conference with a sub-committee of employers and employed, and are now in force.

*H.M. Stationery Office; price 2s. 6d. net. Cmd. 2,437.

Lighting.

Lighting is exciting greater interest, but perhaps the most striking feature is the wide inequality in the standard of lighting, not only in different works, but in different parts of the same works. Such inequality is strong evidence of lack of scientific knowledge, and demonstrates the need for putting forward some standard for the guidance of employers and workers, and for obtaining information as to satisfactory practice which can be made known to the persons concerned.

With such objects in view, representatives of the Home Office have, during the past two years, met representatives of both employers and workers in a large number of industries, and have explained the general principles governing good lighting on the lines of the Departmental Committee's reports, and have discussed in detail the requirements of the particular industry. These meetings have proved very useful, and both employers and workers have shown great interest in the subject. In factories where attention has been given to supplying a good light for fine or very fine processes, tests showed the amount of illumination in every case to be over three foot candles, and in many cases above five foot candles. In one process where a good light is recognised as important, the factory had been newly equipped with an installation affording an illumination of from 13 to 23 foot candles for each worker, while in the same factory for the same process the light previous to the new installation was less than one foot candle. Both employers and workers were delighted with the improved lighting and found it entirely satisfactory.

Provided that the eyes are protected from glare, the workers appreciate a high degree of light, and, so far as the inspectors are aware, no injury is caused to the eyes by artificial illumination of from 20 to 30 foot candles if the light is properly shaded and diffused, but the inspectors who conducted the tests lay emphasis upon the need for much greater care in this respect than is commonly exercised. A big problem is that of glare, and in many instances where new lamps have been fitted in old shades the results have been very unsatisfactory. The least satisfactory tests have been those obtained in the spinning and weaving departments of textile factories (other than hosiery). The amount of light provided is, on the whole, low, and there is need for more attention to its equal distribution over the plane of work on the loom or the spinning frame and to the placing of the lights so as to avoid glare on the one hand, and troublesome shadows on the other. Generally, the low readings are not usually due to economy in the use of gas or electricity, but to neglect of upkeep of fittings—globes and shades being dirty or in need of renewal—or to bad placing of lights in relation to the position of the worker or of the machine.

Trade Conditions.

Taking industry as a whole, trade conditions have again been bad, and one of the tragedies of the situation is that so many young people have no opportunity of learning a trade, and there is real danger that in some of the staple industries, when the revival in trade at last arrives, there will be found a shortage of skilled labour. It has been suggested in some quarters that older workers, more especially in the case of women, were being replaced by young labour, but the inspectors have not in fact obtained any evidence of this.

Some branches of engineering have been very busy, more particularly those connected with electrical developments, wireless apparatus, motor transport, and railway plant. Perhaps the most noteworthy development is the continued and rapid increase in the generation and use of electricity, which is referred to by the senior electrical inspector.* Important developments, too, have been taking place in the chemical industry; a new plant, the only one of its kind in this country, has been erected in one area for the manufacture of sulphuric acid by the Schmiedal process, which is capable of turning out 1,000 tons of concentrated acid a month, and in the same area a plant has been completed for the manufacture of synthetic ammonia. What is said to be the largest alcohol factory in Europe has been started up in the Hull district, and in Grangemouth the large new oil refinery is now working to full capacity. An entirely new process, the manufacture of endurite, has been started in connection with a paper mill in the Edinburgh district, and this promises to develop greatly. This is to use up all the waste products from the esparto grass, the coarse fibre of which is unsuitable for paper making. At present many of the mills pay large sums annually for the removal of this waste, which will now be collected, ground, and pressed in steam and hydraulic presses. The resulting material can be stained to any colour, and may be used in the manufacture of combs, buttons toothbrushes, &c., just like the casein products. Its principal use, however, will be in electrical work, as it possesses extremely high electrical resistance. There have also been developments in machinery, and a good deal is said in this year's divisional reports concerning labour-saving appliances.

The British Silk Research Association is collaborating with the British Electrical and Allied Industries Research Association in research on the electrical insulating properties of silk, and on the improvement of the method of preparing silk destined for electrical purposes.

*See ELEC. REV., July 10th, 1925.

New Electrical Devices, Fittings and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

Combined Electric Fire and Electro-Vapour Radiator.

The accompanying illustration, fig. 1, is of a novel design of electric fire and electrically heated water radiator combination marketed by MESSRS. BENHAM & SONS, LTD., 64, Wigmore Street, W.1. The control of the fire is entirely separate from that of the immersion heater, under the radiator, for the heating of the water.

The combined convected and radiant heat has many advantages in the office and home. The large heating surface of

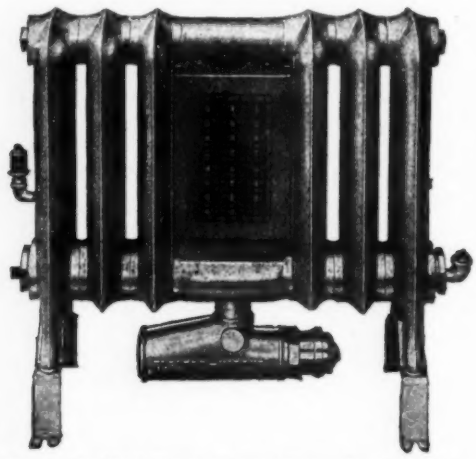


Fig. 1.—Combined Electric Fire and Electro-Vapour Radiator.

the water radiator keeps the room at an even temperature, while the electric fire, in the centre, supplies additional comfort. The elements of both the "fire" and the immersion heater are of sound construction.

These combinations are made in sizes up to 4,000 W total capacity suitable for pressures of from 100 to 240 V on a.c. or d.c. supplies.

A New Rotary Transformer for Battery Charging.

The latest product of MESSRS. NEWTONS, of Taunton, which is being marketed by MESSRS. ROTAX (MOTOR ACCESSORIES), LTD., Rotax Works, Willesden Junction, London, N.W.10, is a new rotary transformer for battery charging, illustrated herewith, fig. 2. This model consists essentially of two armatures mounted on a single shaft of ample dimensions to prevent flexure, a point of importance in the design of double armature machines having two bearings only. Separate field magnets are provided for the motor and the generator, permitting pressure regulation from full to zero. Special regulation coils are fitted to ensure constant pressure over long periods. These coils are in series with the motor armature and are wound so as to assist the shunt windings. The temperature

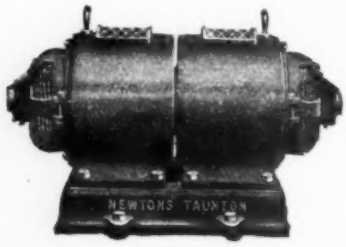


Fig. 2.—A Battery Charging Transformer.

rise is claimed to be very moderate. Messrs. Newtons also make a model, designed to meet the case where two different pressures are required simultaneously, which carries a second and smaller generator excited in a similar manner. Three bearings are fitted to this machine.

Powdered "Insalute" (Liquid Porcelain).

According to *The Electrical News, Toronto*, the TECHNICAL PRODUCTS CO. has developed a new adhesive fireproof and acid proof insulating cement which is being marketed under the name of "Powdered Insalute." It is also being used for assembling metal to wood, asbestos, mica, porcelain, glass, &c., because it is not necessary to melt it to make it stick. It does not become conductive until heated above 1,000 deg. F. (the best porcelain becomes conductive at about 1,500 deg F.). If insulation is required at higher temperatures, insalute may be mixed with other refractory materials. It is stated that insalute may be used as a binder for making furnace cements, cementing asbestos tubes, assembling materials of various natures, and for use as a paint where organic materials will not withstand heat.

An Armour Plate Coal Crusher.

Power gives an illustrated description of a new coal crusher recently put on the market by the PENNSYLVANIA CRUSHER CO., Philadelphia. This crusher is built in sizes from 18 in. diameter roll and 24 in. wide to 30 in. diameter roll and 72 in. wide, giving capacities of from 30 to 500 tons per hour. With the exception of the breaker plate and roll segments, the crusher is made entirely of steel, 30-in. H girders being used for the side frame construction. Cross members of heavy channel and angle plates are hot-riveted to the girder-beam side frames. Steel bearing housings, shouldered into the side frames to take the shear, and hot-riveted in position, are fitted with interchangeable die-cast bearing bushings. Lubrication is effected by large grease cups in the frames over the bearings. The crushing roll is of special segmental construction, having no bolts through the crushing surface. The segments are held in place by tapered steel dowels and one through bolt. The breaker plate tip, which takes the major portion of the wear in the crusher, is of manganese steel, and is renewable. The plate is readily adjustable for varying the fineness of crushing.

A Switch and Transformer Combination.

This is the latest production of MESSRS. W. FRANCIS & CO., LTD., Manor Road, Altrincham, Cheshire, which will appeal to engineers who are faced with the difficulties of installing new plant in restricted spaces.

The transformer core and windings are housed in the switch pedestal which forms a substantial flame proof, oil-immersed, transformer tank. Fig. 3 is a general view of the device with the tank removed.

The switch is of the draw out type—oil-immersed—and so interlocked that it is impossible to withdraw the switch without first switching "off" and, though when withdrawn the switch can be operated "dead" for adjustment and inspection, it cannot be plugged in again unless it is in the "off" position, thus ensuring that the circuit cannot be closed with the engagement only of the plugs. The switch tank is also interlocked in order that the tank cannot be removed until the switch has been withdrawn, nor can the switch be re-plugged in until the tank is replaced.

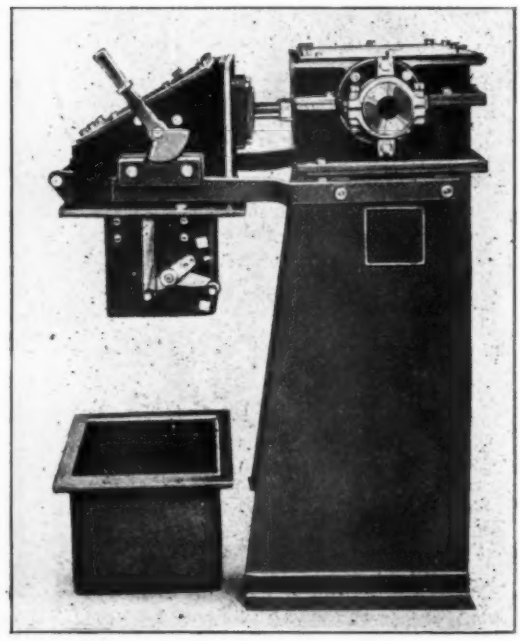


Fig. 3.—A Combination Switch and Transformer.

The plug and terminal chamber is arranged for taking the h.p. cables straight through, without cutting, thus ensuring the continuity of the main cable system. The plug sockets and the split terminal for the cable connections are moulded into an insulated base and plugs and sockets for disconnecting the main cable and the h.p. side of the transformer are provided.

The complete unit is rated for 3,300 volts; it is of strong and compact construction both electrically and mechanically, and, it is claimed, will render reliable service under the most trying conditions incidental to mining.

Electricity Supply in Ulster.

A Northern Ireland National Scheme.

A COMPREHENSIVE scheme of electricity development for Ulster was outlined by Mr. Johnstone Wright, M.I.E.E., M.I.Mech.E., city electrical engineer, Belfast, to the Commission on the Natural and Industrial Resources of Northern Ireland, which held its thirty-third session in the Municipal College of Technology, Belfast, on July 9th, under the presidency of Viscount Charlemont.

Mr. Wright is reported by the *Belfast News-letter* to have pointed out, *inter alia*, that a comprehensive scheme was of the greatest importance, but the difficulties of attaining that desirable end were not so much technical as financial and administrative. Uttering a warning against expecting too much, he said there were certain defined limits below which the price of electricity from a public supply network could not fall, but within a reasonable radius and under normal conditions supply would be cheaper than from small isolated plant. Heavy capital charges were the bane of the electricity supply industry. Their effect could be mitigated in no other way than by improving load factor, and thus a scheme for any district must be based on the load factor which the industry of that district would give. The same remarks could be made to apply to a water power scheme, for it was quite possible to have a water power scheme (which was a true coal conservation scheme) with such a heavy capital cost that it could not produce a cheaper supply than a coal-fired station. Any country that launched a comprehensive national electricity supply scheme might be doing a very good thing for the future, but unless the Government of the country was prepared to finance the undertaking for a number of years the scheme would operate to the advantage of future consumers at the expense of the present ones. There was no doubt about the benefits of an abundant electricity supply in any country, but he believed such a supply should be developed gradually on economic lines with an eye to the future and with some form of Government assistance for schemes on which there would not be an immediate return due to providing for future development, but were likely to be economic, say, within ten years. The position in Ulster was somewhat different from that in the defined electricity districts in England and Scotland. There were only two public electricity authorities of any size at present—Belfast, with a normal rated plant capacity of, say, 43,000 kW, and Londonderry, with a plant capacity of 6,500 kW. For the year ended March 31st, 1925, Belfast generated 47,699,610 kWh and Londonderry 539,716 kWh. The distance between the two stations was, roughly, 62 miles and no possible advantage in load factor or otherwise could accrue from linking up those two stations at the present time. In fact, it was impossible from an economic point of view. Witness said that at the outset, financial assistance would be required to develop a large scheme, though he thought that in the course of time there would be a possibility of repayment. Small stations in urban areas were wasteful and expensive, and could not be incorporated in a large network.

By means of a large scale map witness explained details of a scheme for Ulster. The first thing which struck one were the facilities for electrification of the whole district by means of railway electrification. Unfortunately, he was afraid that was not practical politics in the meantime; and, if possible, a scheme must be considered which, while not overlooking railway electrification, was not based on it.

Sources of Supply.

The two existing sources of supply were Belfast and Londonderry, and two outstanding possible sources, Coalisland and the River Bann (Carnroe), in future years might take part in a comprehensive scheme when that stage of development was reached. The sites could not be better placed from a distributing point of view. The greater part of the power load was centred around Coalisland and Belfast. Londonderry, although just as well placed as Belfast from an efficient generation point of view, was at present far removed from the load centres, and for that reason alone he thought it must be left out of any primary discussion. Prospects of generation at Coalisland seemed to be the most promising, for there coal was within easy reach of an ample water supply for condensing purposes. He would not recommend building the station at the colliery as the use of cooling towers at the colliery would involve a loss in efficiency far exceeding the cost of coal transport to the bank of Lough Neagh. If the colliery developed, would it not be better to extract the household grade of coal from the tonnage brought to the Lough bank and transport this part of the output alone by rail, convert the remainder into electricity, and distribute by this means throughout Northern Ireland? A scheme of this kind had considerable possibilities, and with pulverised fuel equipment there was no difficulty in operating efficiently with all grades of coal, and the advantages of distributing electricity instead of transporting steam-raising coal were obvious. The promoters of the Northern Ireland Electricity Supply Bill might have done better, if they had considered a co-operative scheme.

Cost of Power Stations.

At the Belfast station, for instance, there was ample spare plant during the summer months to supply any Bann scheme network during drought periods, and the Belfast Corporation would be only too glad to assist in any scheme which would not involve increased capital, but make better use of the existing capital. It was more than possible that a working agreement between a Bann scheme and a coal-fired station might result in a lower capital cost on a Bann scheme and more efficient use of capital at the coal-fired station, resulting in lower charges to the consumers. In order to ascertain the economic possibility of supply at the various load centres he had designed a main transmission network capable of meeting the full requirements of the area, to be supplied from Coalisland, the Bann or Belfast, the ring main pole-line system being adopted as far as possible, transmission being at 33,000 volts. He estimated the cost of this complete transmission system, including pole lines (and cables where necessary) of 10,000 kW capacity, transformers and switchgear at load centres, but exclusive of buildings and distribution networks at load centres, would be £428,000. Assuming an average selling price of 1½d. per kWh, a reasonable price for bulk supply, the revenue from a demand of 6,500 kW on a 25 per cent. load factor, which would mean an output of 14,200,000 kilowatt-hours per annum, would be roughly £89,000 per annum. This would give a return on the capital cost of transmission network of approximately 21 per cent. If to the capital of the network was added the capital, say, at Coalisland, the result would be roughly as follows:—A steam-fired station consisting of two 10,000-kW turbo-alternators (one spare), complete with boilers to steam 10,000 kW (one boiler spare) at £20 per kilowatt of actual steaming capacity, plus £60,000 for spare plant, would cost £260,000. This gave a total capital of £688,000, on which the return with a revenue of £89,000 would be 13 per cent. Interest and sinking fund charges alone would absorb at least 8 per cent. A station utilising the Bann water, while having a greater capital cost, might give a better return due to lower operation costs, but this depended entirely on the capital cost of construction works. Again, the position of the Bann development in relation to the load centres made it very improbable that it could show any advantage, as the capital cost of transmission and the losses would be higher than those from, say, the Coalisland site. If the Bann development and transmission to Ballymoney and Limavady were cut out of the transmission scheme, there would be a saving in capital on transmission lines of about £54,000.

Considerable Financial Risk.

From those rough figures it was fairly obvious that any authority or company undertaking such a comprehensive scheme would be taking very considerable financial risk, unless a substantial subsidy were available for, say, 10 years. The financial results of a complete scheme were disappointing, but one must face economic facts although fully realising the benefit of public electricity supply to any community. If that represented the position in the industrial North of Ireland, as he believed it did, there was room for apprehension in connection with some larger projected schemes in non-industrial areas.

Under the existing prospective load conditions he could see no hope of financial success arising out of a station at Coalisland at the present time, and less prospect from the development of the Bann scheme, but he was far from suggesting that the idea should be given up altogether. The financing of the initial stages was the main stumbling block.

For an expenditure of about £1,000,000 a very complete system could be laid down, embracing the industrial area—a small expenditure when one considered the ultimate gain; but it was a political question as to how far a Government was justified in incurring that total expenditure for future results. The cost of scrapping old methods delayed ultimate development. The most promising field for first stage development was on the Lisburn, Lurgan, Portadown, Armagh, Dungannon line. Lisburn was within comparatively easy reach of Belfast, but even that supply could not be undertaken by the Corporation unless a demand of at least 1,500 kW was assured from the very commencement of supply, and there seemed little prospect of that. The Harbour power station at Belfast was quite capable of being developed at a minimum cost to give bulk supply to meet the whole needs of the area, and for first stage development at least it would be foolish to incur the capital cost of generation when a supply was available.

Concluding his formal evidence, witness said it would pay the country as a whole to bear the initial cost of the scheme in taxes, having in mind the ultimate results. If they electrified the railways, electrification of the whole of Northern Ireland would be simple.

Women in Science, Industry, and Commerce.

An International Conference of Women at Wembley.

ON Wednesday, July 15th, the first International Conference of Women in Science, Industry, and Commerce was opened at the British Empire Exhibition by the president, H.R.H. the Duchess of York, who addressed encouraging remarks to the large gathering of members of the Women's Engineering Society and kindred associations, including the Electrical Association for Women. Lady ASTOR, M.P., was in the chair, and said that the Conference afforded the opportunity to review the work that women had already done in these new fields, and would stimulate them to further efforts.

Lady RHONDDA expressed the view that business men should take their daughters into their businesses—until that was done they would never get many women into the higher ranks of commerce.

Miss ELLEN WILKINSON, M.P., maintained that women should not undercut the wages paid to men, and Miss MARGARET BONDFIELD said that women in industry were given inferior jobs on account of their lack of organisation. Several other ladies spoke, including delegates from overseas.

The Conference was convened by the Women's Engineering Association, in co-operation with the British Federation of University Women, the Industrial Welfare Society, the Institute of Industrial Welfare Workers, the National Union of Scientific Workers, the Standing Joint Committee of Industrial Women's Organisations, and the Electrical Association for Women. The members were entertained to luncheon at the Garden Club by the British Electrical Development Association; the Duke and Duchess of York were present, and Lady Astor presided.

After the loyal toast, Miss V. HOLMES, A.M.I.Mech.E., A.M.I.M.E., proposed "Women in Science, Industry, and Commerce," contrasting the conditions of 20 years ago, when practically no women took part in those pursuits, with those of to-day, when large numbers of women were thus engaged. The difficulties they met with in engineering were greater than in other branches of industry, yet hundreds of women were employed in that calling, and one engineering firm was "manned" entirely by women.

Responding, Miss MARGARET BONDFIELD, J.P., referred to the manual labour performed by women as chain and nail makers 40 years ago, and said that while they now enjoyed equal opportunity, they were underpaid as compared with men of equal skill. A revolution had taken place in processes of production; factories were equipped with machines in which the skill was incorporated, and were operated by "minders." There were still men's processes, but most jobs to-day were suitable for women to work at. Women would gain greater influence in industry; let it be a humanising influence, elevating industry to a higher plane. They asked for a clear road, free from the obstacles of prejudice and tradition, to make industry what it ought to be—the servant of life.

Mr. W. B. WOODHOUSE, president, I.E.E., proposing "Electricity in the Service of Women," said the Electrical Development Association was glad of the opportunity of welcoming that very important conference and assisting in a notable movement. Industrialism had been built up by engineers with the aid of the steam engine, which led to concentration in factories and towns; electricity would enable them to abolish smoke and redistribute the works in pleasanter surroundings, by its use in transport, for power; in the use of electricity in the home, he particularly welcomed the co-operation of woman, the real home designer. Electricity reduced domestic drudgery, but electrical apparatus required maintenance, and there was a big field for women engineers to specialise in the design and upkeep of appliances for home use.

Lady ASTOR responded, thanking the E.D.A. for the entertainment extended to the members, and expressing the hope that women in industry would not be bound by tradition; let them be helpful in the workshop as they were in their homes, and import spiritual qualities into public life.

After the luncheon a conducted tour of the Exhibition was made, a special display of women's work having been arranged for this day by exhibitors.

Vehicle Head Lamps.

On July 16th the morning session was concerned with engineering, chemistry, and research. A contribution on "Automotive Research," by Miss Ethel H. Bailey (of the Research Department of the Society of Automotive Engineers, in America), outlined some of the work being done by that organisation, which was established in 1921. Active work had been started anew on the subject of vehicle headlights, and a special committee had been appointed to investigate the visibility tests on which the present specifications were based, and to make recommendations as to the advisability of further tests. It was not the intention of the Committee to recommend specific devices, but to consider fundamental principles.

Electricity in Mines.

"Electricity Applied to Mining" was the subject of a paper by Miss H. M. DAVIS (of Messrs. Metropolitan-Vickers), which was read on Thursday morning. The author stated that the use of electricity in mines was rapidly increasing, and proceeded to describe in outline its various applications to mining operations, from the coal seam to the railway truck, giving special attention to winding plant. For the sake of high thermal efficiency the supply of electricity from "super-stations" was generally advocated, but she considered that this system was not necessarily the solution of the problem of obtaining cheap power, and in the case of collieries might be distinctly inferior to a scheme involving the sub-division of the generating plant. High thermal efficiency did not necessarily result in high commercial efficiency; the colliery load factor rarely exceeded 50 per cent., and the transport of electricity was much more costly than the transport of coal. Unless energy could be supplied to the collieries at about 0.7d. per kWh, most collieries would be well advised to generate power for themselves.

To meet the special conditions met with in colliery power stations, a scheme had recently been introduced known as the "S.P." scheme,* the principle of which was the complete separation of the winder load from the remainder of the power supply about the colliery. The energy for winding was supplied by means of a high-pressure condensing turbine driving through reduction gearing the Ward-Leonard generators for the winder, a flywheel being added to equalise the steam demand from the boiler plant. The remainder of the power was generated by high-pressure condensing turbo-generator units. This arrangement appeared to offer an economic solution for the power supply of the larger collieries. An example on this principle had been installed at a large Yorkshire pit, and was operating satisfactorily. This system claimed big economies over either the central power station or the steam winder mixed-pressure turbine arrangement of power supply, largely due to the elimination of transmission losses and peaks in the first case, and the more efficient utilisation of steam in the second.

The elimination in this manner of the intermittent winding peaks would have the effect of improving the load factor on the central station, but the solution of the problem was still only half complete. Taken over the period of one winding shift, the load was reasonably constant, but taken over a longer period, such as a day or week, the load still fluctuated to an enormous extent. The complete solution of the problem was very much more difficult of achievement, since it would appear to call for the complete re-arrangement of the working periods. In the author's opinion, while this would be an extremely difficult matter, the difficulty was not by any means insuperable, and it appeared that in the course of a few years, with the sincere co-operation of all parties concerned, such a rearrangement of working shifts could be carried out, resulting in an immense improvement in the load factor, and consequent reduction of the power costs.

Mrs. MATTHEWS (of the Consolidated Pneumatic Tool Co., Ltd.) opened the discussion by saying that many excellent examples of the flywheel storage method of meeting the peak loads of the winding seemed to meet the requirements of a large number of mines. It was a system, moreover, which would probably prove more valuable when the "super-power" stations came into use, because it would then be necessary to take special precautions to prevent undue rushes of current from the main power station during the period of accelerating the load on the winding gear. Progressive operators were fast realising the ease and value of applying machines instead of muscles for shot-hole boring. Her company's new machine was built for use in gaseous or fiery mines, the electric motor being enclosed in a gas-tight case and, in order to reduce the weight, air cooling was adopted; through an extra casing surrounding the motor air was blown by a fan, and it thus became a portable machine, easily handled by the average miner. When introducing appliances of this kind, one had to fight harder against the prejudices of the man whose labour one was trying to reduce than against the conservatism of the mineowner.

Miss DAVIS, replying to the discussion, said that the use of a.c. and d.c. for winding gear depended upon the programme at the pit. The Ward-Leonard equipment was, on an average, about 1.7 times more expensive in initial cost than a.c. equipment, but on a large equipment with a flywheel, the reduction in the energy consumed at the start of the wind and the equalisation of the peaks, would warrant the installation of the d.c. system. The saving in energy was so great that the equipment would pay for itself in a few years.

The final paper of the morning session was by Miss Isabel H. Hadfield, M.Sc., of the National Physical Laboratory, who discussed some chemical problems in the cotton industry.

Welfare and Factory Inspection.

The afternoon was devoted to questions relating to industrial welfare and factory inspection. The first paper was by Miss Constance Smith, who stressed the important part which

* The system was described in the ELECTRICAL REVIEW of April 24th, 1925; pp. 674-6.

women factory inspectors had played in industrial history. The effect of welfare work on health and efficiency was discussed in a paper by Miss C. U. Kerr (of the Industrial Welfare Society), who gave many concrete examples of increased efficiency and better health among workers as the result of such work. The author's viewpoint was distinctly practical rather than philanthropic. It was a striking tribute to the value of welfare work that, in spite of an unprecedented industrial depression, its practice and ideals had been everywhere maintained—sometimes cut down considerably—but still maintained both in the letter and the spirit.

The possibilities of advancement for women in industry was dealt with in a paper by Miss E. E. Wilson (of the Institute of Industrial Welfare Workers). Economically, the position of women was serious, owing to the unemployment of men still remaining an unsolved problem. Tradition was one of the most serious factors; the custom of assigning without question a particular kind of work to a man, without considering whether it could, with or without some modification, be better done by a woman, was difficult to break down. Temperamentally, women were different; they took more interest in the personal side, had greater intuition, but were not so logical as men, and were possibly more timid. Some of these difficulties, however, under control, might probably prove to be assets rather than hindrances.

On July 17th the morning session was devoted to a discussion on commerce and salesmanship, and papers were read by Miss G. Burlton, B.A., and Miss L. F. Nettlefold, LL.B., dealing respectively with salesmanship and the place of the wholesaler in the scheme of distribution.

Electricity—Domestic Science.

In the afternoon there was a discussion on the production and distribution of electricity, and its uses in the home, whilst demonstrations of electrical apparatus were also given. Alderman Mrs. HAMMER, of Hackney, who is ever ready to preach the gospel of electricity, especially in its domestic applications, presided over an interested audience of ladies, and in her opening remarks spoke convincingly about the bringing of electricity into every home.

The first paper was by Miss M. Partridge, B.Sc. (of the Electrical Association for Women), on "Producing and Distributing Electricity." She explained that the wide differences in price of electricity in different districts were mainly due to "difficult people." There was little room for improvement in the efficiency and reliability of generating plant, but load factors varied widely according to local habits and customs. The cost of distribution for lighting was three times the cost of production. In rural districts overhead lines were essential to cheap supply, but their cost was greatly increased by the opposition of local authorities and land owners, and the requirements of the Postmaster-General. Unexpected additions to the demand in a district might threaten overloading the mains, and necessitate restrictions on the supply pending the provision of increased carrying capacity. The cost of wiring also was a serious obstacle to development, tenants being unwilling to wire their houses for the benefit of the landlord. It was unfortunate that electricity and gas undertakings were nearly always in fierce competition—if it were not so, more might be done in the way of standardising the practice of providing light, heat, and power services in houses.

In order to satisfy inquirers about the reasons for different costs in different districts, the author made a list of various items that made up the cost of electricity supply to private dwellings and came to the conclusion that 90 per cent. of the cost variations might be gathered under one main heading—"difficult people." It was unfortunate that electricity and gas undertakings were nearly always represented by different financial interests. If it were not so, there was no doubt that more might be done in the way of either making the service installation a standard and necessary part of the house equipment, chargeable to the landlord and recoverable by an equitable rent return, or else by giving the tenant who paid for the installation the possession of it, so that he would be at liberty to sell it at a valuation to either landlord or incoming tenant when he completed his tenancy. Gas companies often practically gave away everything except the gas. The author knew of one electricity company which gave a present of three free lighting points and one free heating point in each house. This pleased the tenant, who usually willingly paid for a few necessary extra lighting points. Hire-purchase terms also got over some of the difficulties, but plumbing was not carried on in this patchy way; it was part of the building, as electric power should be.

The final paper was "At Home with Electricity," by Miss T. J. Dillon, B.Sc. (of the Domestic Science Department of King's College for Women, Lecturer in Physics at the College, and Demonstrator at the London School of Medicine for Women), who dealt in simple language with the first principles of electricity and pointed out that a knowledge of first principles was necessary because, although electricity had been introduced into many homes, the users would not be happy until they were more at home with it.

Mrs. HOSTER, in opening the debate, said that she had had electricity installed in her own flat at her own expense, but no one else in the same building had it because it was too expensive. If it were twice as dear as other means she would use it, but not while it was four times as dear.

Miss PARTRIDGE pointed out that there were several districts in London where electricity was used in all the working-class houses; it was unfair to generalise and to say that it was expensive for cooking, because it was not.

Alderman Mrs. HAMMER said that it was a paying proposition up to 3d. per unit, and there was no question about its being more healthy.

Mr. L. L. ROBINSON (Borough Electrical Engineer, Hackney), on the question of cost, said that he had over 600 cookers on his mains. Electricity was supplied at 1d. per unit and the cost of gas was about 9d. per therm, and on that basis the general opinion of his consumers was that electricity cost from 75 to 100 per cent. of the cost of cooking by gas. Occasionally there were complaints that electricity cost twice as much as gas, but in every case investigated, the trouble had been found to be due to the faulty use of the cooker by the housewife. Nowhere in England should consumers be paying more than 2d. per unit for heating, and any undertaking charging more than that should be put out of existence. With regard to the difficulty of first cost of an installation, thousands of contractors could not afford to do anything except on cash terms, but if they helped the municipalities to obtain the powers to carry out installations, those municipalities would give contractors the orders to effect the installations and would themselves sell them on easy payment terms.

Mrs. WILSON, M.B.E., said that she had a private installation for the supply of electricity, but when supplied by the municipality in her district electricity was very dear.

Mrs. BALDWIN urged that housewives should be shown how to use electric cookers; some of those present had come for that very reason.

Miss C. GRIFF, A.M.I.A.E., said that electricity was economical when supplied on contract rates. At her home in Warwickshire the price was 30s. per quarter, and 1½d. per unit during the summer and 2½d. during the winter. Ordinarily the unit cost 7d. or 8d. If there were lighting and a power plug in every room, the cost would be less than at the ordinary rate, but supply companies would not tell the consumers that, and until they asked for the contract rate they did not get it. Her bill was about £2 10s. per quarter, and its use for lighting and heating was not stinted. It was not used for cooking, however.

Alderman Mrs. HAMMER compared electric with gas cooking from the point of view of health, and Miss PARTRIDGE, replying to the discussion, said it was not so easy to demonstrate electric cooking in a rural district as in Hackney, while Mr ROBINSON suggested the use of a travelling exhibition on a light Ford car.

Legal.

Miller v. Scintillating Sign Co., Ltd.

IN this debenture holder's action Counsel moved before Mr. Justice Eve in the Chancery Division, on July 17th, for the appointment of a receiver and manager of the defendant company. He said the principal money in plaintiff's debentures was not due nor was the interest in arrear, but five or six actions were pending against the company. The plaintiff held debentures to the amount of £2,030 out of a total of £3,460. The company was an electrical sign advertiser, and had a large number of contracts running. In reply to the Judge, Counsel said that he was told that Mr. Miller was a director of the company.

His LORDSHIP said that that had better be disclosed; it was not sufficient for Mr. Miller to describe himself as a "Government contractor."

Charles Harold & Co., Ltd., v. Andrews.

AT the Birmingham Assizes last week, before Mr. Justice Rowlatt, Messrs. Charles Harold & Co., Ltd., bullion dealers, Birmingham, brought an action against Charles Andrews, engineer and dealer in electrical and automobile accessories, Birmingham, for alleged breach of warranty and for a return of £200 advanced on the sale of "platinum" magneto points. It was stated that the defendant sold to the plaintiff company a number of magneto contact points which both parties thought were platinum points. Alternatively, it was suggested that the defendant had been guilty of fraudulent misrepresentation, because the points were found to be not platinum but tungsten. For the first delivery the defendant was paid with a cheque for £73 10s., which was stopped before payment. The plaintiff paid £200 on account of a second delivery. A first acid test led the plaintiffs' works chemist to believe that a pair of sample points were platinum. Analysis showed that those brought by the plaintiffs were tungsten, which reacted better to the acid test than platinum even.

The jury found that the purchases were not made on the faith of a warranty that the points were platinum; that the purchases were not induced by fraud; that the plaintiffs purchased 999 pairs expressly subject to analysis; that the plaintiffs were not guilty of negligence towards the defendant in testing the points; and that the defendant bought on the strength of plaintiffs' statement of the result of the test.

The judge found that the plaintiffs were entitled to judgment for £200 with costs, except that defendant was entitled to the costs of the issue as to warranty, as to fraud, and as

to mutual mistake. The plaintiff recovered on the ground that the delivery of the 999 pairs was subject to analysis, and that, the analysis proving unsatisfactory, the contract failed. As to the counter-claim, the defendant was entitled to £73 10s. with costs, but the plaintiffs were entitled to the costs of the issue as to the sale of 999 pairs and 2,400 pairs. Judgment was entered accordingly.

A Borough Electrical Engineer's Libel Action.

AT the Manchester Assizes on July 16th Mr. Ralph Lomax, the borough electrical engineer of Stockport, sued Messrs. Connell & Bailey, Ltd., the proprietors of the *Stockport County Borough Express*, for damages in respect of the publication of two letters in that journal, which, the plaintiff alleged, reflected upon him. The defence was that the published words had no defamatory meaning, and that they were fair comment upon matters of public interest. The case is fully reported in the *Stockport Advertiser* for July 17th. The jury awarded Mr. Lomax £10 damages in respect of each letter, and Mr. Justic Fraser certified for a special jury.

General Electric Co., Ltd., v. Dobson.

AT the Newcastle County Court recently the General Electric Co., Ltd., Newcastle, sued J. E. Dobson, a motor engineer, for £8, the balance of the price of an electric sign. The defendant complained that the plaintiff company, instead of supplying a sign with a front consisting of a single piece of opal glass, had inserted panelled glass. A witness for the plaintiff company explained that this was done to enable the front to withstand a greater wind pressure. The defendant agreed to pay the balance if his instructions were carried out, and on this understanding Judge Greenwell adjourned the case *sine die*, making no order as to costs.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The London and Home Counties Electricity Supply Scheme.—In our necessarily abbreviated report of the proceedings before the Select Committee of the House of Lords which is dealing with this Order (ELEC. REV., July 10th, p. 52), we stated that Mr. Sydney Morse, who appeared for the four-company group, supported an amendment proposed by Mr. Seager Berry, for the ten-company group, exempting those authorities which were not represented on the Joint Authority from the necessity of contributing to the funds of that body. Mr. Morse informs us that he did not support the amendment, of which he had not had notice. He merely agreed with Mr. Berry that the scheme had been sufficiently discussed in the course of the various departmental inquiries and the committee stages of the Nos. 1 and 2 Bills.

The London Tubes.—On July 14th, Dr. SALTER asked the Minister of Transport whether a public inquiry was to be held as to the advisability of constructing a tube railway in South-East London; if so, when such an inquiry was likely to take place and by whom it would be held; and whether the local authorities of the South London Boroughs would be permitted to give evidence.

Col. ASHLEY said that the answer to the first part of the question was, so far as he was aware, in the negative. He had referred to the London Traffic Advisory Committee, for its advice and report, questions relating to the alleged inadequacy of passenger travelling facilities in certain districts of London, including the South-Eastern district. The Committee informed him that it proposed to hold public inquiries in connection with these questions, and that it would afford every opportunity to the local authorities concerned to present their views on the questions involved.

Imperial Radio Communication. — On July 14th, Mr. AMMON asked whether, in connection with the development of the Empire wireless chain, the sites had yet been acquired for the erection of the stations for communicating between Great Britain and Australia and India.

Lord WOLMER, Assistant Postmaster-General, said that sites near Grimsby (for the transmitting station) and near Skegness (for the receiving station) had been selected for the beam stations for communication with Australia and India, and it was hoped that the purchase of the various properties concerned would be completed at an early date. The order for the erection of those stations had already been placed with the contractors.

Anglo-German Telephone Service.—On July 14th, Lord WOLMER informed Lt.-Commdr. KENWORTHY that it was hoped to open an Anglo-German telephone service in about 12 months' time. The circuits would pass through Holland. The submarine cable was on order by the Dutch Government, and the various land lines were being laid.

B.B.C. Profits.—On July 14th, Lord WOLMER informed Sir R. GOWER that the whole of the profits received by the British Broadcasting Co. after the payment of 7½ per cent. dividend, which absorbed only £5,172, had been invested in additions to plant. The Postmaster-General did not propose to reduce the licence fee pending the report of the Committee which the Government was about to appoint to examine the arrangements, financial and otherwise, for the maintenance of the broadcasting service.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

6,987. "Circuit-breaker for ignition apparatus, more especially for such as are used in high-speed internal-combustion motors." Allgemeine Elektricitats Ges. March 19th, 1923. (213,260.)
7,019. "Electric conductors." F. H. Holmes. March 19th, 1924. (235,931.)
7,044. "Tone-regulating devices used in wireless telephony reception." C. H. Gardner. March 19th, 1924. (235,932.)
7,358. "Starting of electric motors." British Thomson-Houston Co., Ltd., and G. O. Watson. March 22nd, 1924. (235,936.)
7,455. "Magneto-electric machines." British Thomson-Houston Co., Ltd., A. P. Young, and E. G. Parrott. March 24th, 1924. (235,940.)
7,460. "Chain circuits particularly applicable to telephone systems." Automatic Telephone Manufacturing Co., Ltd., and F. Tench. March 24th, 1924. (235,941.)
7,524. "Production of permanent magnets." J. E. Gee and F. S. Gee. March 25th, 1924. (235,947.)
7,544. "Electrical connections for telephone headsets." C. Brandes, Inc. November 5th, 1923. (224,493.
7,559. "Thermionic valve-holder." R. F. Graham. March 25th, 1924. (235,948.)
7,753. "Electrically-driven clocks." C. E. Prince. March 26th, 1924. (235,959.)
7,824. "Electric cut-out switches." English Electric Co., Ltd., and T. Zweigbergk. March 27th, 1924. (235,960.)
7,978. "Glow cathode for discharge tubes." Telefunken Ges. für Drahtlose Telegraphie. May 30th, 1923. (216,840.)
8,588. "Compensated induction motors for single or polyphase alternating current." Deutsche Werke Akt. Ges. April 6th, 1923. (213,928.)
8,635. "Electric thermal cut-outs." British Thomson-Houston Co., Ltd. (General Electric Co.). April 5th, 1924. (235,982.)
9,999. "Telephone systems." T. H. Howell and R. G. Ferguson. April 18th, 1923. (214,665.)
10,174. "Electric muffle furnaces." L. W. Wild, E. P. Barfield, and J. D. Coleman. April 24th, 1924. (235,993.)
10,574. "Methods of starting alternating-current motors." J. Lyons and Co., Ltd., and A. G. Goddard. April 29th, 1924. (235,996.)
11,065. "Electric switches." A. C. Greene. May 5th, 1923. (236,005.)
11,092. "Electric safety lanterns." T. A. Edison. May 17th, 1923. (216,116.)
11,872. "Contact for electric batteries." G. Pearson.. May 14th, 1924. (236,010.)
12,678. "Crystal detectors for wireless receiving purposes." E. M. Wildey. May 23rd, 1924. (236,018.)
13,002. "Automatic electric power stations." Metropolitan-Vickers Electrical Co., Ltd. May 28th, 1923. (216,876.)
13,492. "Electric condensers." L. Levy. June 1st, 1923. (216,901.)
14,129. "Insulating materials for submarine and other cables or conductors." Western Electric Co., Ltd. (Western Electric Co., Inc.). June 11th, 1924. (236,026.)
14,166. "Electric ignition systems for internal-combustion engines." A. G. Mumford, Ltd., and A. W. Booth-Royd. June 11th, 1924. (236,027.)
14,377. "Electric headlamps for motor-cycles and the like." British Thomson-Houston Co., Ltd., A. P. Young, and A. G. Salisbury. June 13th, 1924. (236,029.)
14,579. "Electric locomotives for use underground and on the surface." R. H. Patterson and R. H. P. White. June 17th, 1924. (236,032.)
15,328. "Radio-transmitting systems." Marconi's Wireless Telegraph Co., Ltd. June 25th, 1923. (218,299.)
15,392. "Clip devices applicable for use in display stands or for supporting electric light or gas globes or the like." T. J. Saveker. June 26th, 1924. (236,039.)
16,141. "Headlights for motor-cars and other vehicles." A. J.-B. Marsat. July 13th, 1923. (219,001.)
19,257. "Production of refractory bodies for electrical or other purposes." B. Bell. August 13th, 1924. (Samples furnished.) (236,063.)
19,587. "Control of electric motors." English Electric Co., Ltd., and T. Zweigbergk. August 18th, 1924. (236,064.)
20,161. "Electric motor-control systems." English Electric Co., Ltd., and F. D. H. Bremner. August 26th, 1924. (236,068.)
20,306. "Telephone systems." Siemens & Halske Akt. Ges. November 17th, 1923. (224,865.)
20,364. "Electro magnets." Western Electric Co., Ltd. (Western Electric Co., Inc.). August 27th, 1924. (236,070.)
20,436. "Apparatus for obtaining retary motion from an electrically-vibrating arm." J. Jolley and J. E. Booth. August 29th, 1924. (236,071.)
20,897. "Frequency transformers." C. Lorenz Akt. Ges. September 7th, 1923. (221,507.)
21,026. "Electric water-heating apparatus and the like." K. F. Henneman and P. Kerkhoven. June 13th, 1924. (235,513.)
21,976. "Distribution of alternating-current energy." International General Electric Co., Inc. September 18th, 1923. (222,131.)
22,798. "Electric discharge devices." British Thomson-Houston Co., Ltd. December 13th, 1923. (226,165.)
22,798. "Mechanism for effecting angular displacement of the brushes in commutator dynamo-electric machines." British Thomson-Houston Co., Ltd. October 3rd, 1923. (222,877.)
23,841. "Insulators for the suspension of live cables for electric railways or the like." A. Linde. October 8th, 1924. (236,085.)
24,258. "Rotary condensers for wireless telephony." Telefon und Signal Ges. February 25th, 1924. (230,010.)
25,567. "Electric condensers." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (H. R. van Deventer). October 27th, 1924. (236,091.)
26,165. "Electric hot-plates." P. E. Forget. November 13th, 1923. (224,880.)
26,391. "Automatic or semi-automatic telephone systems." Coventry Automatic Telephones, Ltd., and C. W. Wilman. November 5th, 1924. (235,771.)
27,365. "High-tension current transformers." Siemens & Halske Akt.-Ges. December 11th, 1923. (226,174.)
28,153. "Automatic distribution of current for electric traction locomotives." V. Goddaer. November 24th, 1924. (235,776.)
28,205. "Electric arc cutting." C. J. Bird, H. E. C. Wade, and P. Jackson. November 25th, 1924. (Addition to 231,978.) (236,098.)
28,639. "Diaphragm sounders." F. Krupp Germaniawerft Akt.-Ges. December 1st, 1923. (225,569.)
28,919. "Electric motors." B. Heger. May 14th, 1924. (234,048.)
30,772. "Protective arrangements for polyphase electrical circuits." Metropolitan-Vickers Electrical Co., Ltd. January 8th, 1924. (227,430.)
30,802. "Loud-speaking telephonic receivers." E. A. Graham. December 22nd, 1924. (235,783.)

1925.

1,651. "Spark-preventing device for electromagnetic or inductive circuits." G. Mombur. January 18th, 1924. (227,870.)
2,492. "Diaphragm for radio loud-speakers, gramophones, microphones, and the like." R. Sornaes. February 8th, 1924. (228,880.)
6,302. "Telephone receivers for headsets." C. Brandes, Inc. November 5th, 1923. (Divided application on 224,493.) (230,491.)
6,794. "Apparatus for the electrical precipitation of suspended particles from gaseous fluids." Lodge-Cottrell, Ltd. March 12th, 1924. (Addition to 216,789.) (230,841.)
7,584. "Electric connectors." British Thomson-Houston Co., Ltd. March 25th, 1924. (231,479.)